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VEGETATION RESOURCES OF THE VERNON MAP SHEET AREA

N.T.S. Map 82L

Volume 1 – Vegetation and Selected Interpretations

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ERRATA

The following plant species names are incorrect throughout the text and tables in Volume I:

In Text	Correct Name
luetkia	luetkea
yellow avalanche lily	yellow glacier lily
swamp black gooseberry	black swamp gooseberry
western meadowrue	western meadow-rue
smooth woodrush	smooth wood-rush
wild ginger	western wild ginger

ABSTRACT

The vegetation of the Vernon map sheet area is diverse in response to variation in climate and site conditions. The diversity of the plant cover is characterized by vegetation types.

The vegetation of the area is characterized by two Regions: the Dry Interior and Interior Wet Belt Regions. Within each Region patterns of zones (climatic climax potential) and subzones (successional patterns) are recognized.

A standard reconnaissance vegetation survey was implemented and 290 vegetation plots were located. Computer analysis of the plots resulted in the identification of forty-five vegetation types, representing seral and climax vegetation in the Dry Interior and Interior Wet Belt Regions. For each type the relationships between environmental characteristics and vegetation were assessed. The evaluation of these relationships is important for the application of the vegetation information to resource management.

Interpretations of each vegetation type are made for wildlife, forestry and recreation values. The interpretations provide information which can be used to assess relative values of vegetation for different uses.

ACKNOWLEDGEMENTS

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As well as serving on the editorial committee Jim van Barneveld provided motivation and support, and Dave Low assisted in the formulation of interpretations for wildlife management.

Rod Davis and Bob Marsh, of the Air Studies Branch, provided climate data which characterized the Regions and Sections of the report area.

Special thanks are extended to Elaine Ellison for her perseverance and thoroughness in preparation of the report.

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chapter one

INTRODUCTION

1. INTRODUCTION

1.1 GENERAL INTRODUCTION

This vegetation report is the result of fieldwork conducted in 1973 in the Vernon map sheet area (82L). Figure 1.1 shows the location of the study area. A total of 290 vegetation plots were located and sampled according to Terrestrial Studies Branch procedure (van Barneveld, 1976). These data were analyzed with the following objectives:

1. to classify the vegetation for **Region***, **Section** , **zone** , **subzone** and **vegetation type** after standard **biophysical classification** techniques (Walmsley and van Barneveld, 1977)
2. to determine the relationship of the vegetation to other environmental components (terrain, soil and climate)
3. to determine the vegetation changes with time considering different kinds of disturbance (fire, clearing, grazing and logging)
4. to identify and evaluate selected resource values, for the purpose of resource management
5. to map vegetation (zonation and present ecological condition maps have been done for 82 L at a 1:50 000 scale)

The appendices contain technical data necessary for the practical application of the vegetation information to resource management.

*Words in heavy type are defined in the glossary (Appendix A).

1.2 VEGETATION AND THE LANDSCAPE

The classification of the landscape into meaningful units of vegetation is necessary in order to understand the opportunities and limitations for use of that landscape. Vegetation can be described in terms of Regions, Sections, zones, subzones, broad vegetation groups and vegetation types. The vegetation samples reflect the relationship of the plants to terrain, soil and climate at all of these levels. The samples are grouped into vegetation types (Figure 3.1), with each type reflecting environmental conditions. The similarity of environmental features within vegetation types is the most important factor for assessing management options.

In this volume, vegetation types are discussed in general terms (broad vegetation groups - Figure 3.1). Vegetation type descriptions are presented in Vegetation Resources of the Vernon Map

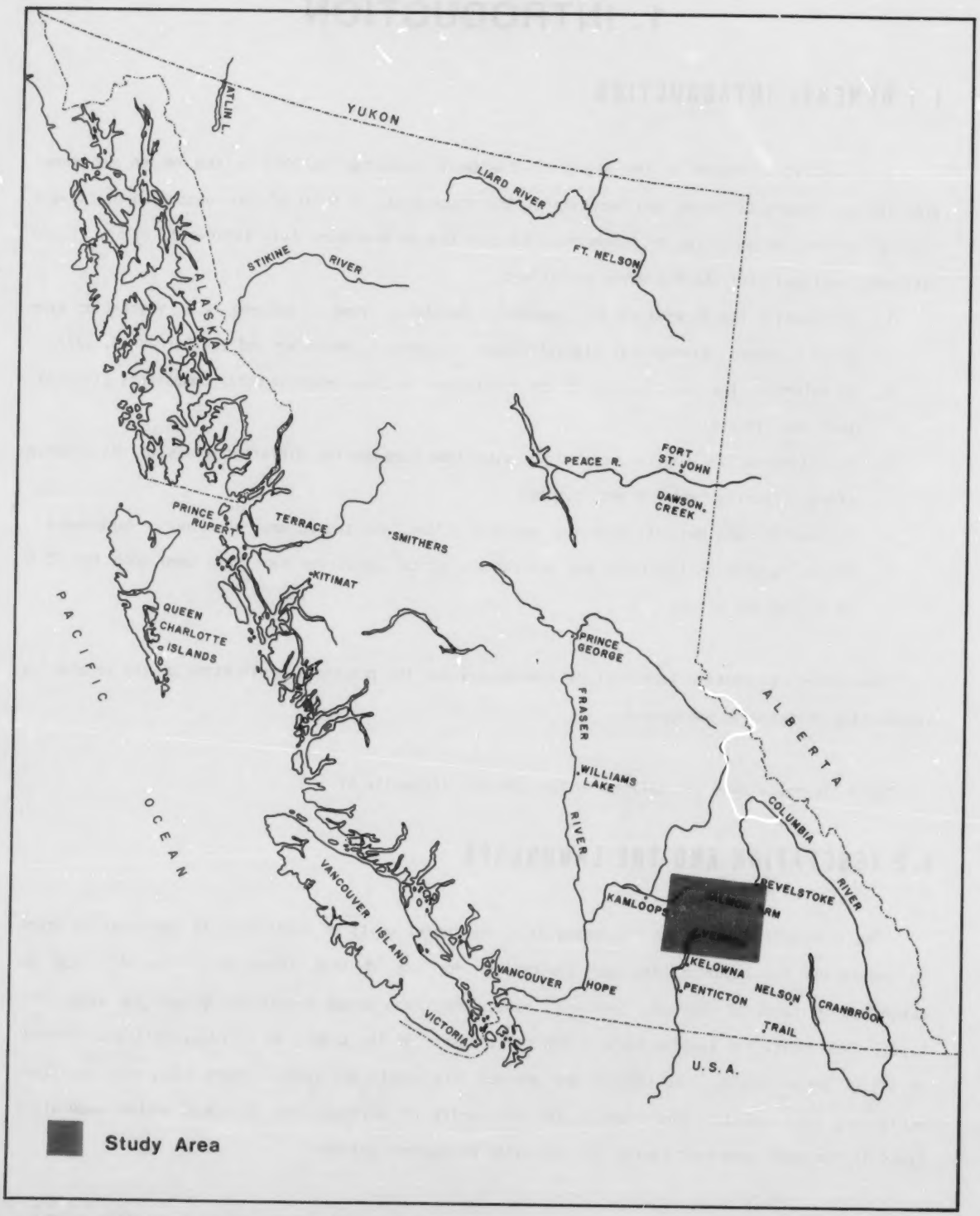


Figure 1.1 Location of Study Area

Sheet Area, Volume II - Technical Data (Clement, 1981). The broad groups and vegetation types can be recognized on the basis of a few key plants (Key to the Vegetation Types - Volume II). Recognition of these is essential for the application of the information in this report to resource management for wildlife, forestry and recreation.

chapter two

REGIONAL ENVIRONMENTAL FEATURES

2. REGIONAL ENVIRONMENTAL FEATURES

2.1 CLIMATE

Moisture availability is a critical factor for the growth of most plants and the variation in precipitation throughout the study area is directly reflected in the extent of the Regions (Figure 2.1).

Within the Vernon map sheet area the general direction of air-flow is west to east with precipitation increasing eastward. There is also a considerable precipitation gradient from south to north. The variation in west-east and south-north precipitation gradients is shown in Table 2.1 (Environment Canada, 1975). Complete precipitation data for stations relevant to the study area are presented in Table 2.2.

TABLE 2.1

PRECIPITATION GRADIENTS IN THE VERNON MAP SHEET AREA

North

West			East
	CHASE - 396.8 mm	REVELSTOKE - 1096.2 mm	
	KELOWNA - 320.1 mm	WHATSHAN LAKE - 609.6 mm	

South

During the growing season the west to east movement of air is subdued, and precipitation is primarily a result of cooling of rising air (Davis, pers. comm.). In spring and fall storms continually track across the area from west to east with the highest precipitation totals associated with the Monasnee Mountains. In the winter months cold air may extend southward from the Arctic and precipitation falls in the form of snow. The heaviest accumulations occur in the Monashee Mountains. Unless otherwise specified, climate data in the report are from Resource Analysis Branch (R.A.B.) climate networks.

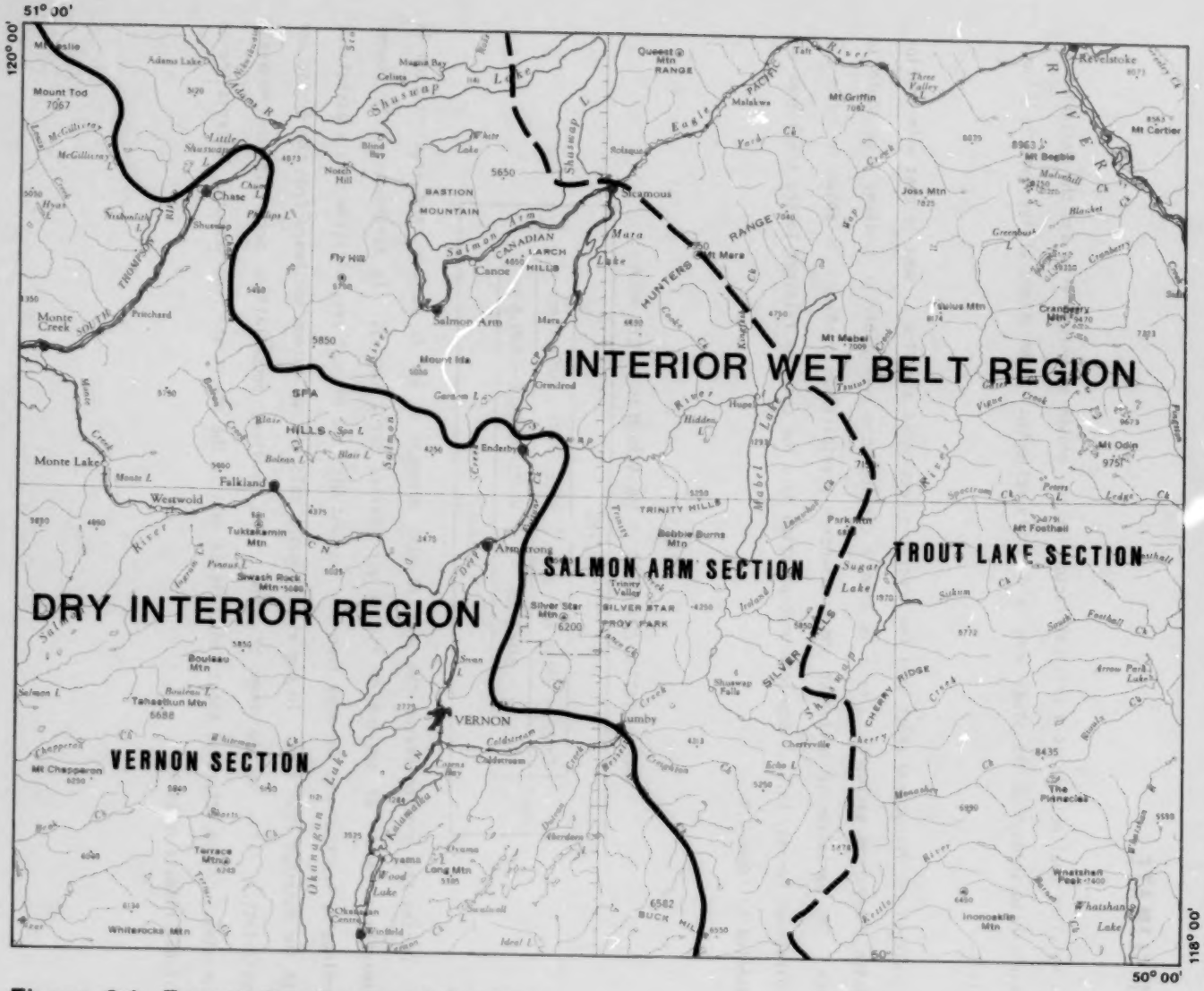


Figure 2.1 Forest Regions and Sections

TABLE 2.2

SELECTED PRECIPITATION DATA FOR THE VERNON MAP SHEET AREA[1]

FOREST REGION	STATION NAME	MEAN ANNUAL PRECIP . (mm)	GROWING SEASON PRECIP . (mm)	MEAN ANNUAL SNOWFALL (cm)
Dry Interior	Kamloops Airport[2]	260.5	128.5	77.1
	Heffley Creek[2]	308.3	143.7	105.1
	Westwold	315.6	153.2	77.1
	Kelowna Airport[2]	320.1	127.8	78.6
	Okanagan Centre	340.4	141.0	70.2
	Vernon	386.7	153.7	108.6
	Vernon Coldstream	392.8	175.7	103.4
	Chase	396.8	158.0	106.2
	Falkland Salmon River	424.4	-	140.0
	Lumby	435.9	215.4	121.8
	Armstrong	447.9	179.1	134.7
Interior Wet Belt	Mabel Lake	486.9	206.2	126.6
	Shuswap Falls	503.0	230.9	128.0
	Sorrento	514.7	205.0	156.5
	Salmon Arm II	530.7	205.5	155.3
	Tappen	535.5	201.9	157.7
	Salmon Arm I	538.2	197.4	156.2
	Fauquier[2]	573.8	238.9	162.8
	Eagle Bay	595.3	228.4	156.9
	Sicamous	604.0	253.5	185.8
	Needles Whatshan Powerhouse[2]	609.6	228.1	195.8
	Malakwa	841.1	314.9	272.5
	Revelstoke	1096.2	322.6	411.6

[1] Precipitation data are from Canadian Normals for Precipitation, 1941-1970, Enviromnent Canada. Stations are ordered by increasing mean annual precipitation.

[2] Stations are outside the project area but are close enough to be relevant.

Precipitation ranges for Regions are as follows: Dry Interior Region - mean annual precipitation 260 to 450 mm, mean annual snowfall 70 to 200 cm[1]; Interior Wet Belt Region - mean annual precipitation 425 to 1100 mm, mean annual snowfall 120 to +350 cm. Precipitation data are summarized for Sections and zones in Table 2.3. Values for **climatic moisture deficit/surplus, growing degree days** and **freeze free period** are related to subzones in Tables 2.4 to 2.6.

2.2 VEGETATION

2.2.1 Regions and Sections

Two Regions and three Sections occur in the project area (Figure 2.1): the Dry Interior Region-Vernon Section and the Interior Wet Belt Region-Salmon Arm and Trout Lake Sections. The Vernon Section of the Dry Interior Region is characterized by hot, dry summers and cool, dry winters.

In the Vernon Section of the Dry Interior Region, ponderosa pine and Rocky Mountain Douglas-fir form **parkland forests** at low elevations (below 1000 m) with dry-environment plants such as big basin sagebrush, brittle prickly-pear cactus, beardless bluebunch wheat grass and arrow-leaved balsamroot. Soils are typically basic in reaction and poorly developed (Eutric Brunisols). Grasslands with soils having well-developed organic surface layers (Black and Brown Chernozems) occur on the driest sites. At higher elevations Rocky Mountain Douglas-fir grows in closed forests with soopolallie, heart-leaved arnica and pine grass. In this environment, soils with leached surfaces and accumulations of clay and minerals in the lower horizons (Gray Luvisols) are common.

The subalpine vegetation consists of two growth forms, subalpine forest and **krummholz** (see Table 2.3 and Table 2.4 for elevational limits). In the forested environment lodgepole pine, Engelmann spruce and alpine fir are the most common trees growing on leached soils (Gray Luvisols and Dystric Brunisols). Shrubs and herbs which predominate are alders, western thimbleberry, black blueberry, broad-leaved arnica and Sitka valerian. Above the subalpine forests the harsh climate limits tree growth, reducing them to stunted krummholz forms. Patches of stunted trees and meadows dominated by luetkia, western pasqueflower and subalpine fleabane are typical. Soils are often poorly developed (Regosols) or have a turfy surface (Dystric Brunisols).

The Interior Wet Belt Region extends eastwards from a line through Lumby, Enderby, Vernon, Armstrong and Chase and is characterized by warm, moist summers and cold, wet winters.

[1] Mean annual snowfall figures are for valley bottom locations within the Regions.

In the Salmon Arm Section, which encompasses the central portion of the study area, summers are hot and moist while winters are cool and wet (Table 2.5).

The most common trees at low elevations (below 1380 m) are Rocky Mountain Douglas-fir and western red cedar (western red cedar often grows as a thick regenerating layer beneath Rocky Mountain Douglas-fir). Soils typically have leached surfaces and minimal accumulations of clay and minerals (Gray Luvisols and Dystric Brunisols). Characteristic shrubs and herbs, reflecting an increase in precipitation associated with the Interior Wet Belt Region, are Utah honeysuckle, Oregon boxwood, California filbert, western thimbleberry, blue-bead clintonia, northern twinflower and large-leaved rattlesnake orchid.

At higher elevations (above 1380 m) western hemlock becomes more common, often replacing western red cedar as the dominant tree. Soils with strongly leached upper layers and high accumulations of iron and aluminum (Humo-Ferric Podzols) are common.

As in the Vernon Section the subalpine vegetation is separated on the basis of upright treed and krummholz growth forms. In the forested parts of the subalpine, lodgepole pine, Engelmann spruce and alpine fir are the characteristic trees growing on strongly leached soils (Humo-Ferric Podzols). Typical shrubs and herbs are black blueberry, Sitka mountain-ash, white-flowered rhododendron, bracted lousewort, Sitka valerian and five-leaved creeping raspberry. With increasing elevation the trees become stunted and dwarfed, growing in islands mixed with meadows dominated by subalpine fleabane, sedges, yellow glacier lily and western spring beauty. Typical soils here are poorly developed (Regosols) or have thick organic-rich surface layers (Dystric Brunisols).

In the Trout Lake Section, found along the eastern side of the study area, summers are warm and moist and winters are cold and wet (Table 2.6).

Old forests of giant western hemlock and western red cedar, with thick moss carpets typically grow on strongly leached acid soils (Humo-Ferric Podzols). Devil's-club often grows in a dense **shrub layer** beneath the decadent trees. Other shrubs and herbs which characterize the Wet Belt are western yew, red huckleberry, black blueberry, red baneberry, common lady fern, oak fern, Canadian bunchberry and unifoliate-leaved foamflower.

Western hemlock often grows in pure stands at higher elevations (above 1320 m), with a continuous cover of oak fern beneath the trees and a thick **moss layer** . Soils are strongly leached, acidic and may have organic accumulations (Humo-Ferric Podzols) in areas of seepage.

The subalpine vegetation is similar to that found in the Salmon Arm Section, although plants reflecting wetter conditions become more prevalent. Under alpine fir and Engelmann spruce forests, on Humo-Ferric Podzol soils, white-flowered rhododendron and black blueberry frequently form a continuous shrub layer. Typical herbs occurring are green false hellebore, Sitka valerian, oak fern, five-stamened mitrewort and twayblades. The krummholz vegetation is characterized by islands of stunted alpine fir and meadows dominated by Merten's cassiope, red mountain-heather, yellow glacier lily, white globe-flower, sedges and western spring beauty. Soils have little development (Regosols) or thick organic surfaces (Humo-Ferric Podzols).

Alpine tundra occurs in the Trout Lake Section above 2300 metres. Although no samples were obtained, it is suspected that representative communities exist in the Monashee Mountains. Dominant plants may include sedges, high elevation grasses, dwarf willows, dryas', saxifrages and luetkia. Soils are typically Regosols in this environment.

In all Sections the krummholz and alpine-like vegetation is highly variable, reflecting specific local conditions such as soil depth, drainage, aspect, shape and slope.

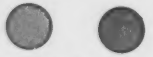
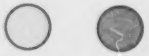
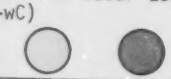
2.2.2 Zones and Subzones

Each Section is composed of zones and subzones which are separated on the basis of **climax** and **seral** trees. Zones and subzones are related to bioclimate. The bioclimates are a function of available energy, available moisture and limiting extremes. Since the effective bioclimate is the result of all climatic factors operating together with landscape conditions, no single parameter is likely to define the bioclimate. As a result, overlaps in the range of climatic parameters for each zone and subzone can be anticipated.

A summary of zones and their associated elevational limits, climatic conditions and typical soils is given in Table 2.3. Subzones within each Section are presented in Tables 2.4 to 2.6. For each subzone a description of characteristic vegetation and soils on representative, dry and wet sites is given. Factors limiting productivity are identified.

The coloured circles in Tables 2.3 to 2.6 relate to the broader levels of the vegetation type relationship diagram (Figure 3.1). Orange and red colours indicate vegetation types of the lower zones of the Vernon Section, yellow and green indicate vegetation types of the lower zones of the Salmon Arm and Trout Lake Sections and blue and purple indicate vegetation types of the subalpine zones in all Sections.

TABLE 2.3
ENVIRONMENTAL FEATURES OF THE ZONES OF THE DRY INTERIOR AND INTERIOR WET BELT REGIONS

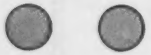
REGION	SECTION	ZONE[1]	ELEVATIONAL LIMITS[2] LOWER-UPPER (m)	ENVIRONMENTAL FEATURES[3]
Dry Interior (DI)	Vernon	Interior Rocky Mountain Douglas-fir zone (ID)	350-1540	Hot, dry summers and cool, dry winters, growing season precipitation 140-250 mm., mean annual snowfall, 140 cm. At lower elevations (below 1000 m) snow accumulations will melt by March and on south and west aspects snow accumulations will be light (less than 30 cm). Typical soils are Eutric Brunisols and Gray Luvisols. Tree canopies are often open with dense grass cover.
		Subalpine Engelmann spruce - alpine fir zone (SAeS-alF) 	1540-2150	Cool, dry summers and cold, dry winters, growing season precipitation less than 250-more than 350 mm, mean annual snowfall 100-200 cm. Maximum snowdepths will not exceed 180 cm and will not decline until May. Typical soils are Gray Luvisols and Dystric Brunisols. Forest canopies vary from open to closed, shrub and herb cover are often sparse.
Interior Wet Belt (IWB)	Salmon Arm	Interior western red cedar zone (IwC) 	350-1380	Hot-warm, dry summers and cool, moist winters, growing season precipitation less than 200-400 mm, mean annual snowfall 120-180 cm. On south and west aspects snow accumulations will often be minimal (less than 40 cm) and will disappear by March. Typical soils are Dystric Brunisols and Gray Luvisols. Forest canopies are often completely closed and western red cedar is regenerating beneath.
		Interior western hemlock - western red cedar zone (IwH-wC) 	615-1380	Warm, moist summers and cool-cold wet winters, growing season precipitation 250-more than 400 mm, mean annual snowfall 130-220 cm. Snow accumulations may persist until April. Typical soils are Dystric Brunisols and Humo-Ferric Podzols. Closed forests of western hemlock and western red cedar or pure western hemlock are characteristic.
		Subalpine Engelmann spruce - alpine fir zone (SAeS-alF)	1380-2215	Cool, moist summers and cold, wet winters, growing season precipitation 250-more than 400 mm, mean annual snowfall 150-300 cm. Snow accumulations may exceed 290 cm and often persist until June. Typical soils are Humo-Ferric Podzols, Luvisolic Podzols. Forest cover varies from open to closed and shrub cover may be continuous and thick.
	Trout Lake	Interior western hemlock - western red cedar zone (IwH-wC)	370-1320	Warm, moist summers and cool-cold, wet winters, growing season precipitation more than 250 mm, mean annual snowfall 190-420 cm. Snow accumulations are significant even at low elevations (100 cm) and will persist until April. Typical soils are Humo-Ferric Podzols. Forests are typically closed western hemlock and/or western red cedar, shrub and herb layers may be sparse.

1 The letters in brackets are standard map symbols for the zones, they are also given for the Regions. The zones are colour-keyed to the characteristic broad vegetation groups (see Chapter three).

2 Zones may occur at elevations other than the stated limits dependent on environmental factors such as aspect, slope and drainage.

3 Mean snowfall figures are from Canadian Normals for Precipitation, 1941-1970, Environment Canada. Snow accumulation figures and dates of zero snow are from Summary of Snow Survey Measurements in B.C., 1935-1975, Hydrology Division, Water Investigations Branch, Ministry of Environment.

TABLE 2.3 (Continued)

REGION	SECTION	ZONE[1]	ELEVATIONAL LIMITS[2] LOWER-UPPER (m)	ENVIRONMENTAL FEATURES[3]
Interior Wet Belt (IWB)	Trout Lake	Subalpine Engelmann spruce - alpine fir zone (SAeS-alF) 	1320-2300	Cool, moist summers and cold wet winters, growing season precipitation 350-450 mm, mean annual snowfall 190-500 cm. Snow accumulations are very high often exceeding 350 cm, and will remain until June. Typical soils are Humo-Ferric Podzols. Forest canopies vary from open to closed Engelmann spruce and alpine fir often with a thick continuous shrub layer.
		Alpine tundra zone[4] (At)	above 2300	Cold, moist short summers and very cold, wet winters, growing season precipitation more than 450 mm, mean annual snowfall 250-more than 500 cm. Snow accumulations may exceed 350 cm, except on windblown ridges and may persist until July. Typical soils are Humo-Ferric Podzols and Regosols. Characteristic vegetation is open tundra dominated by low woody shrubs, herbs, sedges and grasses.

[1] The letters in brackets are standard map symbols for the zones, they are also given for the Regions. The zones are colour-keyed to the characteristic broad vegetation groups (see Chapter three).

[2] Zones may occur at elevations other than the stated limits dependent on environmental factors such as aspect, slope and drainage.

[3] Mean snowfall figures are from Canadian Normals for Precipitation, 1941-1970, Environment Canada. Snow accumulation figures and dates of zero snow are from Summary of Snow Survey Measurements in B.C., 1935-1975, Hydrology Division, Water Investigations Branch, Ministry of Environment.

[4] This zone which was not sampled, is only described for the Trout Lake Section, where elevation is sufficient for it to occur.

TABLE 2.4
ENVIRONMENTAL FEATURES OF THE SUBZONES OF THE VERNON SECTION

ZONE	SUBZONE[1]	ELEVATIONAL LIMITS LOWER-UPPER (m)	ENVIRONMENTAL FEATURES[2]		
			REPRESENTATIVE SITES	DRY SITES	WET SITES
Interior Rocky Mountain Douglas-fir zone (ID)	ponderosa pine subzone	350-920	Growing degree days 1100 to more than 2100, climatic moisture deficit/surplus -400 to 0 mm, freeze free period 100 to more than 140 days, growing season precipitation 140 to 200 mm. Climatic moisture deficits severely limit plant growth, although this is offset in part by the higher number of growing degree days		
			Orthic Eutric Brunisols and Orthic Gray Luvisols. Ponderosa pine and Rocky Mountain Douglas-fir are characteristic trees, common saskatoon and common snowberry are frequently occurring shrubs.	Black and Brown Chernozems and Regosols. Open ponderosa pine forests and grasslands often as a result of slope and aspect. Typical shrubs and herbs are big-basin sagebrush, arrow-leaved balsamroot and brittle prickly-pear cactus.	Gleysols and Orthic Regosols. Black cottonwood and shrubs of red-osier dogwood, common snowberry and willows are characteristic on floodplains. High watertables and poor drainage are typical.
	lodgepole pine subzone	520-1540	Growing degree days 700 to 1500, climatic moisture deficit/surplus -200 to +100 mm, freeze free period 60 to 100 days, growing season precipitation 200 to 250 mm. Climatic moisture deficits may limit productivity.		
			Orthic Gray Luvisols. Ponderosa pine is absent. Lodgepole pine grows on sites after fires, often mixed with Rocky Mountain Douglas-fir. Soopolallie and heart-leaved arnica are typical undergrowth plants.	Orthic Eutric Brunisols. Open Rocky Mountain Douglas-fir or ponderosa pine forests on dry slopes. Characteristic shrubs and herbs are birch-leaved spirea, common juniper and kinnikinnick.	Gleysols and Orthic Regosols. Black cottonwood, white spruce and western red cedar grow on floodplains with typical undercover plants of red-osier dogwood and common snowberry. High watertables and poor drainage.
Subalpine Engelmann spruce - alpine fir zone (SAeS-alF)	Rocky Mountain Douglas-fir - lodgepole pine subzone	1540-1850	Growing degree days 700 to 1100, climatic moisture deficit/surplus -200 to +100 mm, freeze free period 60 to 100 days, growing season precipitation less than 250 to 300 mm. Short growing season and climatic moisture deficits may limit productivity.		
			Orthic Dystric Brunisols and Orthic Gray Luvisols. Rocky Mountain Douglas-fir and lodgepole pine revegetate after disturbance, alpine fir and Engelmann spruce establish slowly.	Lithic Brunisols, Orthic Eutric Brunisols. Open forests of Rocky Mountain Douglas-fir are typical with an undercover of birch-leaved spirea and pine grass.	Gleyed Brunisols, Gleyed Gray Luvisols. Engelmann spruce may dominate with black cottonwood. Red-osier dogwood and western thimbleberry are typical shrubs.

[1] The subzones are colour-keyed to the broad vegetation groups (see Chapter three). The consideration of environmental extremes (wet and dry sites) results in the listing of a wider range of groups than for zones.

[2] Climate data was obtained from Climate Parameter Maps (1979) produced by the Air Studies Branch, Ministry of Environment.

TABLE 2.4 (Continued)

ZONE	SUBZONE[1]	ELEVATIONAL LIMITS LOWER-UPPER (m)	ENVIRONMENTAL FEATURES[2]		
			REPRESENTATIVE SITES	DRY SITES	WET SITES
Subalpine Englemann spruce - alpine fir zone (SAeS-alF)	lodgepole pine - white-bark pine subzone	1540-2000	Growing degree days 700 to 1100, climatic moisture deficit/surplus -100 to more than +100 mm, freeze free period 40 to 80 days, growing season precipitation 250 to 350 mm. Freeze free period and number of growing degree days are factors limiting plant growth.		
			Eluviated Dystric Brunisols. Lodgepole pine usually grows after fires, alpine fir and Engelmann spruce may regenerate after logging and clearing. Alders and black blueberry are characteristic shrubs.	Orthic Dystric Brunisols. Lodgepole pine may persist as a forest component for many years, soopolallie and pine grass are typical understory plants.	Gleyed Brunisols. Engelmann spruce may predominate. Oregon boxwood and twinberry honeysuckle dominate the shrub layer.
	krummholz subzone	1900-2150	Growing degree days less than 700, climatic moisture deficit/surplus 0 to 100 mm, freeze free period less than 40 to 60 days, growing season precipitation more than 350 mm. Short growing season, early frosts and deep snow severely limit productivity.		
			Sombric Dystric Brunisols and Orthic Humo-Ferric Podzols. Alpine fir establishes slowly after disturbance, white-flowered rhododendron and black blueberry are frequently occurring shrubs.	Orthic Regosols. Open treeless vegetation dominated by grasses, Indian paintbrush and luetkia.	Gleyed Sombric Dystric Brunisols. Open lush meadow vegetation usually influenced by seepage, dominated by white globeflower, green false hellebore and yellow avalanche lily.

[1] The subzones are colour-keyed to the broad vegetation groups (see Chapter three). The consideration of environmental extremes (wet and dry sites) results in the listing of a wider range of groups than for zones.

[2] Climate data was obtained from Climate Parameter Maps (1979) produced by the Air Studies Branch, Ministry of Environment.

TABLE 2.5
ENVIRONMENTAL FEATURES OF THE SUBZONES OF THE SALMON ARM SECTION

ZONE	SUBZONE[1]	ELEVATIONAL LIMITS LOWER-UPPER (m)	ENVIRONMENTAL FEATURES[2]		
			REPRESENTATIVE SITES	DRY SITES	WET SITES
Interior western red cedar zone (IwC)	ponderosa pine - Rocky Mountain Douglas-fir subzone	350- 900	Growing degree days 1300 to more than 1700, climatic moisture deficit/surplus less than -200 to -100 mm, freeze free period 100 to more than 140 days, growing season precipitation less than 200 to 250 mm. Even though climatic moisture deficits may be high, the long growing season and precipitation allow for moderate productivity.		
			Orthic Dystric Brunisols and Orthic Gray Luvisols. Rocky Mountain Douglas-fir frequent after disturbance, western red cedar grows in shade, ponderosa pine occasional.	Orthic Eutric Brunisols. Rocky Mountain Douglas-fir often grows in pure stands, ponderosa pine may be a major component with beardless bluebunch wheat grass.	Gleysols and Orthic Regosols. Black cottonwood initial tree with western red cedar and white spruce often regenerating. Typical shrubs are red-osier dogwood and willows.
	Rocky Mountain Douglas-fir - western larch subzone	350-1380	Growing degree days 900 to 1300, climatic moisture deficit/surplus -200 to +100 mm, freeze free period 80 to 140 days, growing season precipitation 200 to 300 mm. Occasional climatic moisture deficits limit productivity, at middle elevations (500-1000 m) this subzone is very productive.		
			Orthic Dystric Brunisols and Brunisolic Gray Luvisols. Rocky Mountain Douglas-fir and common paper birch are dominant trees with western red cedar regenerating.	Orthic Eutric Brunisols and Orthic Gray Luvisols. Rocky Mountain Douglas-fir often dominates tree canopies. Undergrowth plants are common juniper, kinnikinnick and pine grass.	Gleysols, Orthic Regosols and Gleyed Dystric Brunisols. Black cottonwood, white spruce and western red cedar are typical trees.
	lodgepole pine - Engelmann spruce - alpine fir subzone	980-1380	Growing degree days 700 to 1100, climatic moisture deficit/surplus -100 to +100 mm, freeze free period 60 to 100 days, growing season precipitation 300 to 400 mm. Short growing season, frost occurrence and leached soils limit productivity.		
			Orthic Humo-Ferric Podzols and Podzolic Gray Luvisols. Cold air drainage often induces the presence of alpine fir and Engelmann spruce, with western red cedar regenerating.	Orthic Dystric Brunisols. Engelmann spruce may form pure stands often in association with Rocky Mountain Douglas-fir. Pine grass is a characteristic herb.	Gleyed Dystric Brunisols and Gleyed Humo-Ferric Podzols. Western red cedar often grows in pure stands. Western yew and devil's-club are typical shrubs.

[1] The subzones are colour-keyed to the broad vegetation groups (see Chapter three). The consideration of environmental extremes (wet and dry sites) results in the listing of a wider range of groups than for zones.

[2] Climate data was obtained from Climate Parameter Maps (1979) produced by the Air Studies Branch, Ministry of Environment.

TABLE 2.5 (Continued)

ZONE	SUBZONE[1]	ELEVATIONAL LIMITS LOWER-UPPER (m)	ENVIRONMENTAL FEATURES[2]		
			REPRESENTATIVE SITES	DRY SITES	WET SITES
Interior western hemlock - western red cedar zone (IwH-wC)	Rocky Mountain Douglas-fir - western larch subzone	615-1380	Growing degree days 900 to 1700, climatic moisture deficit/surplus -100 to +100 mm, freeze free period 80 to more than 120 days, growing season precipitation 250 to 350 mm. Leached soils and minor climatic moisture deficits are the main factors limiting productivity.		
			Eluviated Dystric Brunisols and Orthic Humo-Ferric Podzols. Rocky Mountain Douglas-fir, western larch and western red cedar may grow in closed stands, Oregon boxwood is a typical shrub.	Orthic Dystric Brunisols. Rocky Mountain Douglas-fir and western red cedar are dominant trees. Undercover varies from pine grass and kinnikinnick to Oregon boxwood and western thimbleberry.	Gleyed Dystric Brunisols, Orthic Regosols and Gleyed Humo-Ferric Podzols. Black cottonwood, white spruce and western red cedar are characteristic trees. Typical shrubs are red-osier dogwood and western yew.
	lodgepole pine - Engelmann spruce - alpine fir subzone	1000-1380	Growing degree days 900 to 1100, climatic moisture deficit/surplus 0 to +100 mm, freeze free period 60 to 100 days, growing season precipitation 300 to more than 400 mm. Soils may be highly leached and frosts may occur frequently due to cold air pooling.		
			Orthic Humo-Ferric Podzols. Cold air drainage often results in the presence of Engelmann spruce and alpine fir, with western red cedar regenerating.	Orthic Dystric Brunisols. Engelmann spruce may grow in pure stands or with western red cedar, pine grass is often a dominant herb.	Gleyed Humo-Ferric Podzols. Western red cedar often grows in pure stands with devil's-club and common lady fern.
Subalpine Engelmann spruce - alpine fir zone (SAeS-alF)	Rocky Mountain Douglas-fir - lodgepole pine subzone	1380-1690	Growing degree days 900 to 1100, climatic moisture deficit/surplus 0 to +100 mm, freeze free period 60 to 100 days, growing season precipitation 250 to 350 mm. Short growing season and frost occurrence are limiting factors for productivity.		
			Eluviated Dystric Brunisols. Rocky Mountain Douglas-fir and lodgepole pine regenerate after fires, alpine fir and Engelmann spruce establish later. Pine grass is a characteristic herb.	Orthic Dystric Brunisols. Rocky Mountain Douglas-fir may form pure stands often with a dominant cover of pine grass.	Gleyed Dystric Brunisols and Gleyed Humo-Ferric Podzols. Engelmann spruce may dominate the tree layer. Typical shrubs are swamp black gooseberry and twinberry honeysuckle

[1] The subzones are colour-keyed to the broad vegetation groups (see Chapter three). The consideration of environmental extremes (wet and dry sites) results in the listing of a wider range of groups than for zones.

[2] Climate data was obtained from Climate Parameter Maps (1979) produced by the Air Studies Branch, Ministry of Environment.

TABLE 2.5 (Continued)

ZONE	SUBZONE[1]	ELEVATIONAL LIMITS LOWER-UPPER (m)	ENVIRONMENTAL FEATURES[2]		
			REPRESENTATIVE SITES	DRY SITES	WET SITES
Subalpine Engelmann spruce - alpine fir zone (SAeS-alF)	lodgepole pine - white-bark pine subzone	1380-1970	Growing degree days 700 to 1100, climatic moisture surplus 0 to +100 mm, freeze free period less than 60 to 100 days, growing season precipitation 300 to 400 mm. Short growing season may inhibit plant growth as will early frost occurrence and infertile soils.		
			Orthic Humo-Ferric Podzols. Lodgepole pine establishes after fires, alpine fir and Engelmann spruce regenerate quickly after other disturbances. White-flowered rhododendron and black blueberry are dominant shrubs.	Orthic Dystric Brunisols. Lodgepole pine may be dominant and have prolonged occurrence. Characteristic shrubs are soopolallie and Oregon boxwood.	Gleyed Humo-Ferric Podzols. Engelmann spruce may dominate. Typical shrubs are swamp black gooseberry, twinberry honeysuckle and devil's-club.
	krummholz subzone	1850-2215	Growing degree days less than 700, climatic moisture deficit/surplus more than +100 mm, freeze free period less than 60 days, growing season precipitation more than 400. Short growing season, frost occurrence and leaching of soils all severely limit productivity.		
			Sombric Dystric Brunisols and Orthic Humo-Ferric Podzols. Coniferous trees slow to establish due to climatic factors. Typical plants are heathers, cassiope, lupines and subalpine fleabane.	Orthic Regosols. Open treeless vegetation dominated by grasses, arnicas and alpine pussytoes.	Gleyed Sombric Dystric Brunisols. Open lush meadow vegetation usually influenced by seepage dominated by white globeflower, green false hellebore, arrow-leaved ragwort, luetkia and sedges.

[1] The subzones are colour-keyed to the broad vegetation groups (see Chapter three). The consideration of environmental extremes (wet and dry sites) results in the listing of a wider range of groups than for zones.

[2] Climate data was obtained from Climate Parameter Maps (1979) produced by the Air Studies Branch, Ministry of Environment.

TABLE 2.6
ENVIRONMENTAL FEATURES OF THE SUBZONES OF THE TROUT LAKE SECTION

ZONE	SUBZONES[1]	ELEVATIONAL LIMITS LOWER-UPPER (m)	ENVIRONMENTAL FEATURES[2]		
			REPRESENTATIVE SITES	DRY SITES	WET SITES
Interior western hemlock - western red cedar zone (IwH-wC)	Rocky Mountain Douglas-fir subzone	370-1320	Growing degree days less than 1700, climatic moisture deficit/surplus more than +100 mm, freeze free period less than 120 days, growing season precipitation more than 250 mm. Leaching of soils and frost occurrence limit productivity.		
			Eluviated Dystric Brunisols and Orthic Humo-Ferric Podzols. Rocky Mountain Douglas-fir may grow in closed forests with western hemlock and western red cedar regenerating. Western white pine is often present.	Orthic Dystric Brunisols. Rocky Mountain Douglas-fir and western red cedar are dominant trees. Typical understory plants are Oregon boxwood, soopolallie, western thimbleberry and pine grass.	Gleyed Humo-Ferric Podzols, Gleysols and Orthic Regosols. Black cottonwood, western red cedar and white spruce are characteristic trees. Understory plants present are red-osier dogwood, willows, sedges and ferns.
	lodgepole pine - Engelmann spruce - alpine fir subzone	1140-1320	Growing degree days less than 1100, climatic moisture deficit/surplus more than 0 mm, freeze free period less than 80 days, growing season precipitation more than 300 mm. Severely leached soils, short growing season and frost occurrences in late spring and early fall are limiting factors for productivity.		
			Orthic Humo-Ferric Podzols. Cold air pooling often results in Engelmann spruce and alpine fir being present, with western hemlock and western red cedar regenerating. Typical undergrowth plants are black blueberry, rusty Pacific menziesia and oak fern.	Orthic Dystric Brunisols. Engelmann spruce and western red cedar may predominate. Typical shrubs and herbs are Oregon boxwood, northern twinflower and pine grass.	Gleyed Humo-Ferric Podzols. Western red cedar often grows in pure forests. Characteristic understory plants are devil's-club, Sitka valerian, cucumberroot twistedstalk and rushes.
Subalpine Engelmann spruce - alpine fir zone (SAeS-alF)	lodgepole pine - whitebark pine subzone	1320-1900	Growing degree days less than 1100, climatic moisture deficit/surplus more than 0 mm, freeze free period less than 80 days, growing season precipitation more than 350 mm. Short growing season, frost occurrence and leached soils all limit plant growth.		
			Orthic Humo-Ferric Podzols. Lodgepole pine regenerates after fires, Engelmann spruce and alpine fir will establish quickly. Frequently occurring plants are white-flowered rhododendron and black blueberry.	Eluviated Dystric Brunisols. Lodgepole pine may be dominant and often persists for many years. Oregon boxwood, grasses and alders are typical undergrowth plants.	Gleyed Humo-Ferric Podzols. Engelmann spruce may dominate the tree canopies. Characteristic shrubs are swamp black gooseberry and twinberry honeysuckle.

[1] The subzones are colour-keyed to the broad vegetation groups (see Chapter three). The consideration of environmental extremes (wet and dry sites) results in the listing of a wider range of groups than for zones.

[2] Climate data was obtained from Climate Parameter Maps (1979) produced by the Air Studies Branch, Ministry of Environment.

TABLE 2.6 (Continued)

ZONE	SUBZONES[1]	ELEVATIONAL LIMITS LOWER-UPPER (m)	ENVIRONMENTAL FEATURES[2]		
			REPRESENTATIVE SITES	DRY SITES	WET SITES
Subalpine Engelmann spruce - alpine fir zone (SAeS-alF)	krummholz subzone	1790-2300	Growing degree days less than 700, climatic moisture deficit/surplus more than +150 mm, freeze free period less than 60 days, growing season precipitation more than 450 mm. Growing season length, snow accumulations, wind and soil temperatures all severely limit productivity.		
			Sombric Humo-Ferric Podzols and Orthic Humo-Ferric Podzols Alpine fir and occasionally Engelmann spruce, grow in stunted forms, and are slow to establish. Heathers, lupines and subalpine fleabane are typical plants.	Lithic and Orthic Regosols. Open treeless vegetation dominated by high-elevation grasses, luetkia, arnica and alpine pussytoes.	Gleysols. Open meadow vegetation on seepage sites and in hollows, dominated by white globeflower, green false hellebore, arrow-leaved ragwort and sedges.
Alpine tundra zone (At)	no subzones defined	above 2300	Growing degree days less than 700, climatic moisture deficit/surplus more than +150 mm, freeze free period less than 60 days, growing season precipitation more than 450 mm. Growing season length, snow accumulations, wind and soil temperatures all severely limit productivity.		
			Sombric Humo-Ferric Podzols. No trees (even stunted forms) are present. Vegetation is characterized by low herbs such as high-elevation grasses, alpine pussytoes and western pasqueflower.	Lithic and Orthic Regosols. Sparse vegetation with exposed mineral soil may be widespread. Typical plants are saxifrages, dryas and mosses.	Gleysols. Open lush meadows on seepage sites and in hollows. Characteristic plants are yellow glacier lily, western spring beauty, sedges and arrow-leaved ragwort.

[1] The subzones are colour-keyed to the broad vegetation groups (see Chapter three). The consideration of environmental extremes (wet and dry sites) results in the listing of a wider range of groups than for zones.

[2] Climate data was obtained from Climate Parameter Maps (1979) produced by the Air Studies Branch, Ministry of Environment.

chapter three

BROAD VEGETATION GROUPS AND SUCCESSION

3. BROAD VEGETATION GROUPS AND SUCCESSION

3.1 BROAD VEGETATION GROUPS

In previous sections of this report, broad patterns of vegetation were identified as Regions and Sections, and similar dominant vegetation was classified as zones and subzones. At a more specific level than zone and subzone, vegetation can be classified into vegetation types. These may be climax or seral stages of vegetation. Each vegetation type is usually found in the same zones and subzones.

The vegetation types display various degrees of similarity and they are grouped into broad vegetation type groups on the basis of these similarities. The vegetation types and their relationship to broad groups are presented in Figure 3.1. The general characteristics of the broad vegetation groups are described in this section (where detailed climate data was not available a brief written description is given). Detailed vegetation type descriptions and photographs are presented in Vegetation Resources of the Vernon Map Sheet Area, Volume II - Technical Data (Clement, 1981).

The vegetation of a number of landscapes was not sampled. This includes **floodplain** communities, wetlands and rock outcrops. The vegetation of these sites is discussed in general terms for wildlife interpretations (Chapter Four).

A key to the broad vegetation groups and vegetation types is also provided in Volume II. This key makes it possible to identify vegetation types in the field, and subsequently apply the ecological principles described in this report to practical management of the landscape.

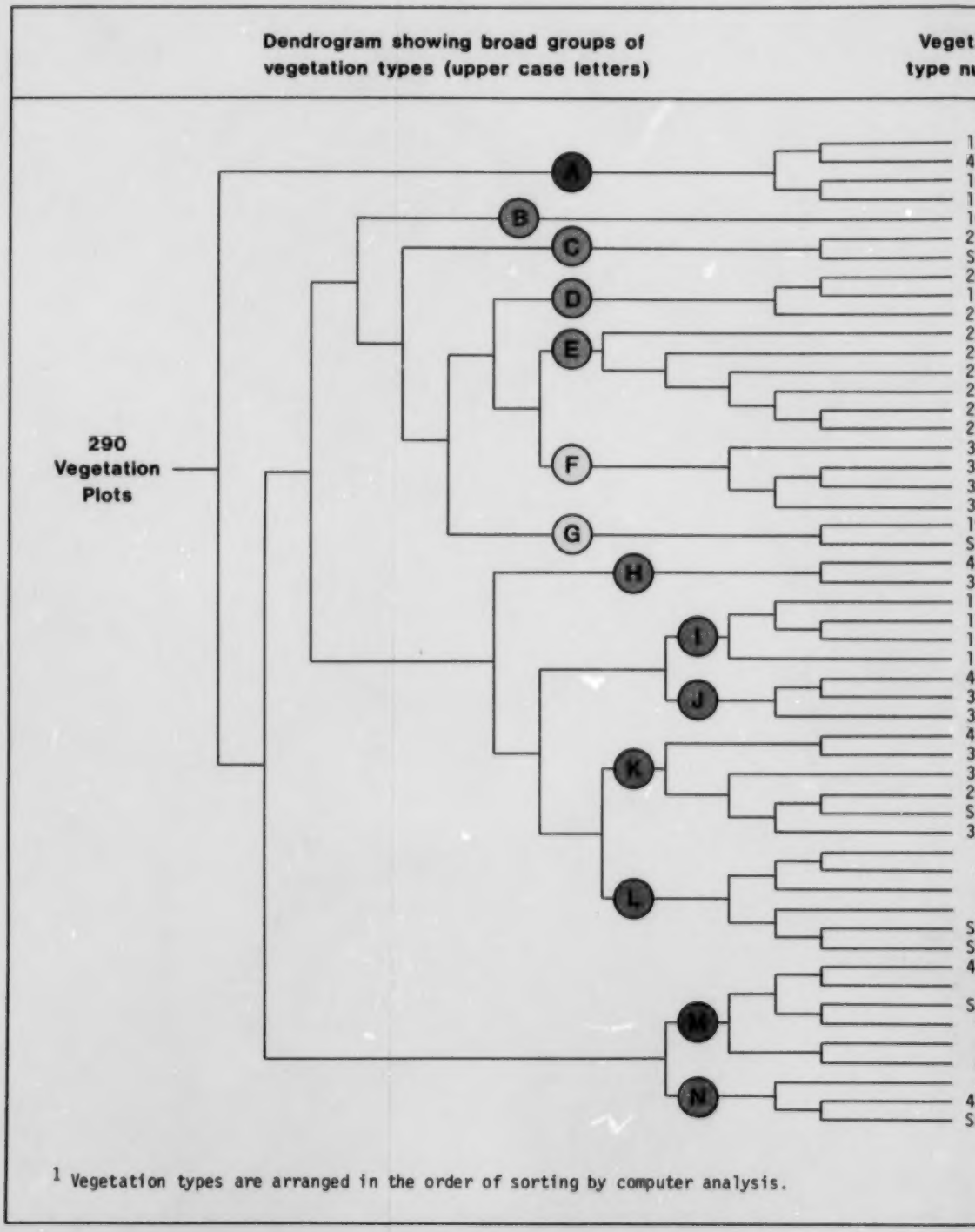
BROAD VEGETATION GROUPS

GROUP A: ●

Climate - Climatic moisture deficit/surplus[1]: -400 to -100 mm
Growing degree days: 1300 to 1900
Freeze free period: 80 to +140 days

Soils - Orthic Black Chernozem
Orthic Dark Brown Chernozem
Orthic Eutric Brunisol
Orthic Regosol

[1] A negative value indicates a deficit, while a positive value reflects a moisture surplus.



[1] Vegetation types are arranged in the order of sorting by computer analysis.

Figure 3.1 Relationships Among Vegetation Types[1]

tion nbers	Vegetation type names and single releves
	Needle-and-thread grass - drooping brome grass - beardless bluebunch wheat grass
	Sandberg's blue grass - yellow salsify - beardless bluebunch wheat grass
	Ponderosa pine - common snowberry - Sandberg's blue grass - Columbia gromwell
	Ponderosa pine - common snowberry - beardless bluebunch wheat grass - common yarrow
	Lodgepole pine - common juniper - pine grass - subalpine fleabane
	Trembling aspen - willows - pine grass - western meadowrue
73367	
	Rocky Mountain Douglas-fir - common saskatoon - pine grass - racemose pussytoes
	Rocky Mountain Douglas-fir - common snowberry - birch-leaved spirea - pine grass
	Rocky Mountain Douglas-fir - ponderosa pine - tall Oregon-grape - pine grass
	Lodgepole pine - Oregon boxwood - showy aster - heart-leaved arnica
	Rocky Mountain Douglas-fir - common paper birch - birch-leaved spirea - large-leaved rattlesnake orchid
	Rocky Mountain Douglas-fir - tall Oregon-grape - pine grass - mountain sweetcicely
	Lodgepole pine - soopolallie - pine grass - showy aster
	Rocky Mountain Douglas-fir - roses - pine grass - white-flowered hawkweed
	Rocky Mountain Douglas-fir - birch-leaved spirea - pine grass - showy aster
	Rocky Mountain Douglas-fir - soopolallie - Oregon boxwood - common western pipsissewa
	Western red cedar - western thimbleberry - birch-leaved spirea - large-leaved rattlesnake orchid
	Common paper birch - western red cedar - Rocky Mountain maple - rough-fruited fairybells
	Common paper birch - willows - Oregon boxwood - blue-bead clintonia
	Lodgepole pine - common juniper - pine grass - kinnikinnick
73180	
	Western thimbleberry - fireweed - oak fern
	Trembling aspen - fireweed - Canadian bunchberry
	Lodgepole pine - alpine fir - black blueberry - blue-bead clintonia
	Lodgepole pine - alpine fir - grouseberry - violets
	Lodgepole pine - alpine fir - Oregon boxwood - one-sided wintergreen
	Rocky Mountain Douglas-fir - alpine fir - Oregon boxwood - Canadian bunchberry
	Rocky Mountain Douglas-fir - western red cedar - Oregon boxwood - western bracken
	Western larch - western red cedar - Oregon boxwood - common western pipsissewa
	Western larch - western red cedar - soopolallie - northern twinflower
	Common paper birch - western red cedar - western thimbleberry - trailflower
	Rocky Mountain Douglas-fir - western hemlock - black blueberry - rough-fruited fairybells
	Rocky Mountain Douglas-fir - western hemlock - birch-leaved spirea - northern twinflower
	Rocky Mountain Douglas-fir - western hemlock - Oregon boxwood - one-sided wintergreen
73213	
	Rocky Mountain Douglas fir - western hemlock - black blueberry - blue-bead clintonia
	Western hemlock - western red cedar - western yew - blue-bead clintonia
	Western hemlock - western red cedar - unifoliate-leaved foamflower - oak fern
	Western hemlock - alpine fir - black blueberry - blue-bead clintonia
	Western hemlock - western red cedar - devil's-club - common lady fern
73212	
73188	
	Black blueberry - Sitka valerian - green false hellebore - oak fern
	Alpine fir - white-flowered rhododendron - black blueberry - Sitka valerian
73031	
	Alpine fir - Sitka mountain-ash - blue-bead clintonia - oak fern
	Alpine fir - white-flowered rhododendron - five-leaved creeping raspberry - Sitka valerian
	Alpine fir - black blueberry - grouseberry - broad-leaved arnica
	Alpine fir - bracted lousewort - broad-leaved arnica - Sitka valerian
	Alpine fir - subalpine fleabane - sedges - smooth woodrush
73125	

This group represents the climax stage of the grassland and ponderosa pine **successional patterns** and the seral stages of the ponderosa pine - Rocky Mountain Douglas-fir successional patterns (successional patterns are presented in Table 3.1). The types in this group are treeless or form a parkland forest of scattered ponderosa pine or Rocky Mountain Douglas-fir. Shrubs are not common although disturbance may result in a continuous cover of big basin sagebrush or common snowberry. The **herb layer** is usually dominated by grasses such as beardless bluebunch wheat grass, needle-and-thread grass, Sandberg's blue grass or drooping brome grass. Other plants growing are arrow-leaved balsamroot, Columbia gromwell, common yarrow and brittle prickly-pear cactus.

GROUP B:

Climate - Climatic moisture deficit/surplus: +100 mm
Growing degree days: 700 to 1100
Freeze free period: 60 to 80 days

Soils - Orthic Dystric Brunisol
Lithic Dystric Brunisol

This group, represented by only one vegetation type, characterizes the seral stage of the lodgepole pine - alpine fir successional pattern on dry sites. The open stands are composed of lodgepole pine with occasional Rocky Mountain Douglas-fir. Amongst the sparse shrubs are Oregon boxwood, black blueberry and alpine fir. Common juniper is also a regular component of the shrub cover. The thick herb cover is variable - frequently occurring plants are pine grass, subalpine fleabane, lupines and common yarrow.

GROUP C:

Climate - Climatic moisture deficit/surplus: -200 to 0 mm
Growing degree days: 1100 to 1700 days
Freeze free period: 100 to 120 days

Soils - Orthic Eutric Brunisol
Orthic Gray Luvisol
Brunisolic Gray Luvisol
Orthic Dystric Brunisol

The trembling aspen successional pattern is represented by one vegetation type, indicating the limited extent of trembling aspen stands in the study area. The variable **tree canopy** is dominated by trembling aspen with minor amounts of lodgepole pine and Rocky

Mountain Douglas-fir. The climax on these sites will be Rocky Mountain Douglas-fir or white spruce. The diverse shrub cover is composed of willows, common saskatoon, common paper birch, trembling aspen, birch-leaved spirea and tall Oregon-grape. Western meadowrue, pine grass, American vetch and cream-coloured peavine are typical in the variable herb cover.

GROUP D:

Climate - Climatic moisture deficit/surplus: -300 to 0 mm
Growing degree days: 1100 to 1900
Freeze free period: 80 to 140 days

Soils - Orthic Eutric Brunisol
Orthic Gray Luvisol
Orthic Dystric Brunisol

Seral and climax stages of the low elevation Rocky Mountain Douglas-fir successional pattern are characterized by Group D. These sites, often on south and west facing steep slopes, are modified by increased exposure to the sun. Forests vary from open to closed, and are composed of Rocky Mountain Douglas-fir and occasional ponderosa pine. The shrub cover is highly variable with common saskatoon, western trumpet honeysuckle, common snowberry, tall Oregon-grape, birch-leaved spirea and roses usually present. The herbs are dominated by pine grass, with large-leaved rattlesnake orchid, showy aster, western fescue and rough-fruited fairybells also occurring.

GROUP E:

Climate - Climatic moisture deficit/surplus: -200 to 0 mm
Growing degree days: 900 to 1900
Freeze free period: 80 to 140 days

Soils - Orthic Eutric Brunisol
Eluviated Eutric Brunisol
Orthic Gray Luvisol
Brunisolic Gray Luvisol
Orthic Dystric Brunisol
Eluviated Dystric Brunisol

This large group of vegetation types represents seral and climax stages of the Rocky Mountain Douglas-fir successional pattern, at low and middle elevations (below 1500 m). In the seral stands lodgepole pine may be present, with Rocky Mountain Douglas-fir and common paper birch dominating. Shrub cover varies in composition and amount of cover - representative species are Rocky Mountain maple, common saskatoon, soopolallie, common snowberry, tall

Oregon-grape, Oregon boxwood, roses and birch-leaved spirea. Pine grass is the dominant herb. Other species found are showy aster, common western pipsissewa, mountain sweetcicely and heart-leaved arnica.

GROUP F: ◯

Climate - Climatic moisture deficit/surplus: -100 to +100 mm
Growing degree days: 1100 to 1500
Freeze free period: 100 to 120 days

Soils - Orthic Dystric Brunisol
Eluviated Dystric Brunisol
Brunisolic Gray Luvisol

This group contains a variety of vegetation types all leading to a climax of western red cedar, with dominant seral tree species being common paper birch and Rocky Mountain Douglas-fir. Western larch and western white pine may also occur. The shrub cover is highly variable, but is always characterized by regenerating western red cedar. Other shrubs present may be Oregon boxwood, black blueberry, Rocky Mountain maple, roses and birch-leaved spirea. Rough-fruited fairybells, common western pipsissewa, large-leaved rattlesnake orchid and one-sided wintergreen are typical herbs.

GROUP G: ◯

Climate - Climatic moisture deficit/surplus: -200 to +100 mm
Growing degree days: 900 to 1100
Freeze free period: 60 to 100 days

Soils - Eluviated Eutric Brunisol
Orthic Gray Luvisol

Open forests of lodgepole pine and Rocky Mountain Douglas-fir are typical of this group representing the high elevation Dry Interior Region lodgepole pine - Rocky Mountain Douglas-fir successional pattern. Always above 1000 metres, on south and west aspects, the sites are typically open with a diverse shrub cover of common juniper, soopolallie, birch-leaved spirea, Oregon boxwood and black blueberry. The herbs are consistently dominated by kinnikinnick, pine grass, northern twinflower and common western pipsissewa.

GROUP H: ●

Climate - variable summers from warm and dry to warm and moist
- cool winters with moderate to high snowpacks enduring until late spring

Soils - Eluviated Dystric Brunisol
Orthic Humo-Ferric Podzol

This group represents recently logged (less than 10 years) sites within the Interior Wet Belt Region, of the western red cedar - western hemlock successional pattern. Trees are absent and typical shrubs are western red cedar, Rocky Mountain Douglas-fir, western hemlock, western thimbleberry, willows, Oregon boxwood and American red raspberry. The herbs are usually dominated by a continuous cover of fireweed. Other plants occurring are western fescue, Canadian bunchberry, common dandelion, pearly everlasting and one-sided wintergreen.

GROUP I:

Climate - Climatic moisture deficit/surplus: -100 to +100 m
Growing degree days: less than 700 to 1000
Freeze free period: less than 60 to 80 days

Soils - Orthic Dystric Brunisol
Eluviated Dystric Brunisol
Brunisolic Gray Luvisol

This group, typically stands of lodgepole pine, is characteristic of two successional patterns: lodgepole pine - Engelmann spruce - alpine fir in both Regions of the study area and alpine fir - western red cedar - western hemlock (influenced by cold air pooling) in the Interior Wet Belt Region. Trees often found are lodgepole pine, Rocky Mountain Douglas-fir, Engelmann spruce and alpine fir; occasionally occurring are western red cedar and western hemlock. Oregon boxwood and black blueberry are always found in the shrub cover while the herbs are characterized by common western pipsissewa, northern twinflower, large-leaved rattlesnake orchid, one-sided wintergreen, Canadian bunchberry, blue-bead clintonia and western meadowrue.

GROUP J:

Climate - summers are warm and moist to wet
- cool winters with moderate to high snowpacks enduring until late spring

Soils - Orthic Dystric Brunisol
Eluviated Dystric Brunisol

Seral stages of the Rocky Mountain Douglas-fir - western red cedar - western hemlock successional pattern are characterized by this group. The variable tree canopy is composed of lodgepole pine, Rocky Mountain Douglas-fir, western larch and/or common paper birch. Western red cedar is always regenerating in the shrub cover, sometimes with western hemlock. Other typical shrubs are birch-leaved spirea, Oregon boxwood, black blueberry and Utah honeysuckle. The herbs are characterized by common western pipsissewa, northern twinflower and western bracken.

GROUP K:

Climate - Climatic moisture deficit/surplus: -100 to +100 mm
Growing degree days: 1100 to 1500
Freeze free period: 100 to 120 days

Soils - Orthic Dystric Brunisol
Eluviated Dystric Brunisol
Orthic Humo-Ferric Podzol

This group represents the Rocky Mountain Douglas-fir - western red cedar - western hemlock successional pattern. Seral trees dominating the **closed forest** may be Rocky Mountain Douglas-fir, common paper birch and/or western white pine. Western red cedar and western hemlock are always regenerating, often in a continuous layer. Other shrubs usually found are western thimbleberry, Rocky Mountain maple, Oregon boxwood and roses. The herb cover, always sparse but diverse, is composed of common western pipsissewa, northern twinflower, one-sided wintergreen and blue-bead clintonia.

GROUP L:

Climate - Climatic moisture deficit/surplus: 0 to +100 mm
Growing degree days: 900 to 1300
Freeze free period: 80 to 100 days

Soils - Eluviated Dystric Brunisol
Orthic Humo-Ferric Podzol
Podzolic Gray Luvisol

This group represents the maturing seral and climax stages of the western red cedar - western hemlock and alpine fir - western red cedar - western hemlock successional patterns. The tree canopy is typically composed of western red cedar and western hemlock; at higher elevations (above 1200 m) Engelmann spruce and alpine fir may occur as trees and shrubs. Western red cedar and western hemlock are always regenerating in the shrub cover; other shrubs present are Oregon boxwood, black blueberry and occasionally Sitka mountain-ash and western yew. Sites receiving seepage may be dominated by a continuous cover of devil's-club. The herbs, growing in patches, are typical of the Interior Wet Belt - unifoliate-leaved foamflower, five-leaved creeping raspberry, oak fern, one-sided wintergreen and Canadian bunchberry. Seepage sites are characterized by common lady fern, wild ginger and cucumber-root twistedstalk.

GROUP M:

Climate - Climatic moisture deficit/surplus: +100 to +200 mm
Growing degree days: less than 700 to 900
Freeze free period: less than 60 to 80 days

Soils - Eluviated Dystric Brunisol
Brunisolic Gray Luvisol
Podzolic Gray Luvisol
Orthic Humo-Ferric Podzol
Sombric Humo-Ferric Podzol

The vegetation types in this group are characteristic of the climax stage of the Engelmann spruce - alpine fir successional pattern in the Dry Interior and Interior Wet Belt Regions. The open to closed tree canopy is dominated by Engelmann spruce and alpine fir, while the shrubs often consist of a continuous cover of white-flowered rhododendron and/or black blueberry. Other shrubs occurring are twinberry honeysuckle, Sitka mountain-ash and currants (swamp black gooseberry). Plants present in the continuous herb cover are Sitka valerian, green false hellebore, oak fern, cucumberroot twistedstalk, unifoliate-leaved foamflower, blue-bead clintonia and five-leaved creeping raspberry.

GROUP N:

Climate - Climatic moisture deficit/surplus: +100 mm
Growing degree days: less than 700
Freeze free period: less than 60 days

Soils - Orthic Humo-Ferric Podzol
Sombric Humo-Ferric Podzol
Orthic Regosol

Sites in this group occur typically at the uppermost reaches of the subalpine forests of both Regions, and represent climax stages of the Engelmann spruce - alpine fir and krummholz successional patterns. The vegetation is of two distinct kinds: 1) open forests intermixed with lush meadow vegetation; and 2) stunted dwarf tree islands mixed with patches of heathers or meadows. Engelmann spruce and alpine fir are the only trees present, with Engelmann spruce becoming less abundant with increased elevation. White-flowered rhododendron may dominate the shrub layer under the open forests. Herbs and dwarf shrubs are the dominant cover, characterized by Merten's cassiope, red mountain-heather, broad-leaved arnica, Sitka valerian, luetkia, bracted lousewort, western spring beauty, sedges, alpine pussytoes, subalpine fleabane, yellow glacier lily and western pasqueflower.

3.2 SUCCESSION

Succession can be described as the changes in vegetation over a period of time. If the vegetation is removed from any piece of landscape, changes occur in the soil, climate and hydrology of that site. The regenerating vegetation will respond to the new environmental conditions and may be quite different from the previous cover.

After logging and burning, a site is available to those plants best able to adapt to the changed environmental conditions. The abundance of light on a logged area allows some plants to thrive, but may cause high soil temperatures and excessive evapotranspiration. Concurrently the burning of slash and vegetation may load the soil with minerals and nutrients. The site conditions after logging and burning are quite different from those prior to logging.

Plants such as fireweed, willows and Rocky Mountain Douglas-fir are well adapted to such conditions, while other plants like western hemlock, oak fern and devil's-club prefer shade and cool temperatures.

With the change in structure and form of the habitat, certain animals may move away from the area while others may migrate in. With logging, species such as caribou and grizzly bear will lose key habitat elements, while black bear and deer may feed in the regenerating vegetation. Birds also are very dependent on availability of habitat. Sapsuckers prefer seral forests of common paper birch and trembling aspen while pileated woodpeckers nest in old-growth Rocky Mountain Douglas-fir and ponderosa pine forests with standing dead trees (Low, 1980). There is a direct relationship between animals and vegetation succesion, expressed in terms of wildlife habitat.

A resource manager who understands succession can manipulate the landscape, specifically the vegetation, to create the vegetative cover best suited for his purposes.

Tables 3.1 to 3.3 illustrate successional patterns for each zone within Sections, and summarize how vegetation changes with various kinds of disturbance. Successional stages (one step in the overall successional pattern) are related to the broad vegetation groups, rate of succession, soils and elevation. The actual sequence of vegetation may vary depending on seed availablity, time, climate, chance establishment, germination requirements and other factors. The precise sequence is difficult to predict, however predictability increases as the vegetation matures. No information is given for the krummholz subzones or alpine zones in any Sections.

TABLE 3.1
SUCCESSIONAL PATTERNS OF THE VERNON SECTION
(The upper case circled letters correspond with broad vegetation groups as described in this Chapter)

ZONE	TYPE OF DISTURBANCE	LANDSCAPE FEATURES	SUCCESSIONAL STAGE - DOMINANT VEGETATION; BROAD VEGETATION GROUP[1]			RATE OF SUCCESSION
			YOUNG SERAL OR CLIMAX →		MATURE CLIMAX	
Interior Rocky Mountain Douglas-fir zone (ID)	Repeated fires or clearing	Low elevations (below 900 m), south and west aspects. Typical soils Black and Dark Brown Chernozems. Most common in ponderosa pine subzone.	grassland; (A)	grassland; (A)	grassland; (A)	Slow
	Repeated fires or clearing	Low elevations (below 1000 m), south and west aspects. Typical soils Black Chernozems and Eutric Brunisols. Most common in ponderosa pine subzone.	grassland; (A)	ponderosa pine; (A)	ponderosa pine; (A)	Slow
	Clearcut logging, clearing or fire	Low elevations (below 1000 m), south and west aspects. Typical soils Eutric Brunisols. Most common in ponderosa pine subzone.	ponderosa pine; (A)	ponderosa pine; (A)	ponderosa pine; (A)	Slower than normal
	Clearcut logging, clearing or fire	Low to middle elevations (below 1200 m), on all aspects. Typical soils Eutric Brunisols and Gray Luvisols. Most common in lodgepole pine subzone.	ponderosa pine; (A)	Rocky Mountain Douglas-fir, (ponderosa pine); (D)	Rocky Mountain Douglas-fir; (D)	Slower than normal
	Clearcut logging, clearing or fire	Low to high elevations (below 1380 m) on all aspects, although predominantly south aspects at higher elevations. Typicals soils Gray Luvisols and Dystric Brunisols. Most common in lodgepole pine subzone.	Rocky Mountain Douglas-fir, (ponderosa pine); (D) (E)	Rocky Mountain Douglas-fir; (E)	Rocky Mountain Douglas-fir; (E)	Normal
	Clearing or fire	Low to middle elevations (below 1100 m), on all aspects, often receiving seepage, typical soils Gray Luvisols. Most common in lodgepole pine subzone.	trembling aspen; (C)	trembling aspen, Rocky Mountain Douglas-fir; (C)	Rocky Mountain Douglas-fir; (E)	Faster than normal

[1] Species in brackets may or may not be present. The upper case circled letters and colours correspond with broad vegetation groups as described in this chapter.

TABLE 3.1 (Continued)

ZONE	TYPE OF DISTURBANCE	LANDSCAPE FEATURES	SUCCESSIONAL STAGE - DOMINANT VEGETATION; BROAD VEGETATION GROUP[1]			RATE OF SUCCESSION
			YOUNG SERAL OR CLIMAX →		MATURE CLIMAX	
Subalpine Engelmann spruce - alpine fir zone (SAeS-alF)	Clearing or fire	High elevations (above 1100 m), on predominantly south and west aspects. Typical soils Gray Luvisols. Most common in Rocky Mountain Douglas-fir - lodgepole pine subzone.	lodgepole pine, (Rocky Mountain Douglas-fir); B G	lodgepole pine, Rocky Mountain Douglas-fir; E	Rocky Mountain Douglas-fir; E	Slow
	Clearing or fire	High elevations (above 1100 m), on predominantly south and west aspects. Typical soils Gray Luvisols. Most common in Rocky Mountain Douglas-fir - lodgepole pine subzone.	Rocky Mountain Douglas-fir; E	Rocky Mountain Douglas-fir; E	Rocky Mountain Douglas-fir; E	Normal
	Clearcut logging, clearing or fire	High elevations (above 1100 m), on predominantly south and west aspects. Typical soils Gray Luvisols. Most common in Rocky Mountain Douglas-fir - lodgepole pine subzone.	lodgepole pine, Rocky Mountain Douglas-fir; I	lodgepole pine, Engelmann spruce alpine fir; I	Engelmann spruce, alpine fir; ●	Normal
	Fire	High elevations (above 1360 m), on all aspects. Typical soils Gray Luvisols and Dystric Brunisols. Most common in lodgepole pine - whitebark pine subzone.	lodgepole pine; I	lodgepole pine, Engelmann spruce, alpine fir; I	Engelmann spruce, alpine fir; ●	Normal
	Clearcut logging, selective logging or clearing	High elevations (above 1360 m) on all aspects, often receiving seepage. Typical soils Gray Luvisols and Dystric Brunisols. Most common in lodgepole pine - whitebark pine subzone.	Engelmann spruce, alpine fir; ●	Engelmann spruce, alpine fir; ●	Engelmann spruce, alpine fir; ●	Fast

[1] Species in brackets may or may not be present. The upper case circled letters and colours correspond with broad vegetation groups as described in this chapter.

TABLE 3.2
SUCCESSIONAL PATTERNS OF THE SALMON ARM SECTION[1]

ZONE	TYPE OF DISTURBANCE	LANDSCAPE FEATURES	SUCCESSIONAL STAGE - DOMINANT VEGETATION; BROAD VEGETATION GROUP[2]			RATE OF SUCCESSION
			YOUNG SERAL OR CLIMAX →		MATURE CLIMAX	
Interior western red cedar zone (IwC)	Clearcut logging, clearing or fire[3]	Low to middle elevations (below 1200 m), on all aspects. Typical soils Gray Luvisols and Dystric Brunisols. Most common in Rocky Mountain Douglas-fir - western larch subzone.	Rocky Mountain Douglas-fir, western larch; (J)	Rocky Mountain Douglas-fir, western larch, western red cedar; (J)	western red cedar; (K)	Normal
	Clearcut logging, clearing or fire	Low to middle elevations (below 1400 m), often on cool aspects. Typical soils Gray Luvisols and Dystric Brunisols. Most common in Rocky Mountain Douglas-fir - western larch subzone.	common paper birch, (Rocky Mountain Douglas fir); (F)	common paper birch, (Rocky Mountain Douglas-fir), western red cedar (F)	western red cedar; (K)	Normal
	Clearcut logging or selective logging	Low to middle elevations (below 1400 m), often on cool aspects, not very common. Typical soils Gray Luvisols and Dystric Brunisols. Most common in Rocky Mountain Douglas-fir - western larch subzone.	western red cedar; (not sampled)	western red cedar; (not sampled)	western red cedar; (K)	Fast
Interior western hemlock - western red cedar zone (IwH-wC)	Clearcut logging, clearing or fire	Low to middle elevations (615-1400 m) often on south to west aspects. Typical soils Dystric Brunisols. Most common in Rocky Mountain Douglas-fir - western larch subzone.	Rocky Mountain Douglas-fir, (western larch), (western white pine), (common paper birch); (K)	Rocky Mountain Douglas-fir, western hemlock, western red cedar; (K)	western hemlock, (western red cedar); (L)	Normal
	Fire	Middle elevations (1000-1400 m), on all aspects often on shallow or coarse materials. Typical soils Dystric Brunisols. Most common in Rocky Mountain Douglas-fir - western larch subzone.	lodgepole pine, (alpine fir); (J)	lodgepole pine, western hemlock, (western red cedar); (J)	western hemlock, (western red cedar); (L)	Normal

[1] All of the successional stages associated with the Interior Rocky Mountain Douglas-fir zone of the Vernon Section may occur in the Salmon Arm Section. The climax stages would occur as a result of aspect, steep slopes, coarse materials and disturbance history.

[2] Species in brackets may or may not be present. The upper case circled letters and colours correspond with broad vegetation groups as described in this chapter.

[3] Repeated fires may produce a cover of pure western larch.

TABLE 3.2 (Continued)

ZONE	TYPE OF DISTURBANCE	LANDSCAPE FEATURES	SUCCESSIONAL STAGE - DOMINANT VEGETATION; BROAD VEGETATION GROUP[1]			RATE OF SUCCESSION
			YOUNG SERAL OR CLIMAX ⟶		MATURE CLIMAX	
Interior western hemlock - western red cedar zone (IwH-wC)	Clearcut logging or selective logging	Low to middle elevations (615-1400 m), on all aspects. Typical soils Humo-Ferric Podzols. Most common in Rocky Mountain Douglas-fir - western larch subzone.	western hemlock, western red cedar; (L)	western hemlock, western red cedar; (L)	western hemlock, western red cedar; (L)	Fast
	Clearcut logging, selective logging or clearing	Middle elevations (1000-1400 m), often receiving cold air in valleys. Typical soils Humo-Ferric Podzols. Most common in lodgepole pine - Engelmann spruce - alpine fir subzone.	alpine fir, (western hemlock), (lodgepole pine); (I)	alpine fir, western hemlock; (I)	western hemlock, (western red cedar); (L)	Normal
Subalpine Engelmann spruce - alpine fir zone (SAeS-alF)	Clearing or fire	Middle to high elevations (1400-1700 m), on south and west aspects. Typical soils Dystric Brunisols. Most common in Rocky Mountain Douglas-fir - lodgepole pine subzone.	lodgepole pine, (Rocky Mountain Douglas-fir); (B)	lodgepole pine, Rocky Mountain Douglas-fir; (B)	Rocky Mountain Douglas-fir; (E)	Slow
	Clearing or fire	Middle to high elevations (1400-1700 m) on south and west aspects. Typical soils Dystric Brunisols. Most common in Rocky Mountain Douglas-fir - lodgepole pine subzone.	Rocky Mountain Douglas-fir; (E)	Rocky Mountain Douglas-fir; (E)	Rocky Mountain Douglas-fir; (E)	Normal
	Clearcut logging, clearing or fire	Middle to high elevations (1400-1700 m), on all aspects. Typical soils Dystric Brunisols and Humo-Ferric Podzols. Most common in Rocky Mountain Douglas-fir - lodgepole pine subzone.	lodgepole pine, Rocky Mountain Douglas-fir; (B)	lodgepole pine, Engelmann spruce, alpine fir; (B) (I)	Engelmann spruce, alpine fir;	Normal
	Fire	High elevations (1400-2000 m), on all aspects. Typical soils Dystric Brunisols and Humo-Ferric Podzols. Most common in lodgepole pine - whitebark pine subzone.	lodgepole pine; (B) (I)	lodgepole pine, Engelmann spruce; (B) (I)	Engelmann spruce, alpine fir;	Normal

[1] Species in brackets may or may not be present. The upper case circled letters and colours correspond with broad vegetation groups as described in this chapter.

TABLE 3.2 (Continued)

ZONE	TYPE OF DISTURBANCE	LANDSCAPE FEATURES	SUCCESSIONAL STAGE - DOMINANT VEGETATION; BROAD VEGETATION GROUP[1]			RATE OF SUCCESSION
			YOUNG SERAL OR CLIMAX →		MATURE CLIMAX	
Subalpine Engelmann spruce - alpine fir zone (SAeS-alF)	Clearcut logging, selective logging or clearing	High elevations (1400-2000 m), on all aspects, often cool locations. Typical soils Humo-Ferric Podzols. Most common in lodgepole pine - whitebark pine subzone.	Engelmann spruce, alpine fir; (M)	Engelmann spruce, alpine fir; (M)	Engelmann spruce, alpine fir; (M)	Fast

[1] Species in brackets may or may not be present. The upper case circled letters and colours correspond with broad vegetation groups as described in this chapter.

TABLE 3.3
SUCCESSIONAL PATTERNS OF THE TROUT LAKE SECTION

ZONE	TYPE OF DISTURBANCE	LANDSCAPE FEATURES	SUCCESSIONAL STAGE - DOMINANT VEGETATION; BROAD VEGETATION GROUP[1]			RATE OF SUCCESSION
			YOUNG SERAL OR CLIMAX →		MATURE CLIMAX	
Interior western hemlock - western red cedar zone (IWH-wC)	Fire	Low to middle elevations (below 1300 m), on south and west aspects. Typical soils Dystric Brunisols. Most common in Rocky Mountain Douglas-fir subzone.	lodgepole pine, (Rocky Mountain Douglas-fir); E	lodgepole pine, Rocky Mountain Douglas-fir; E	Rocky Mountain Douglas-fir; E	Slow
	Fire	Low to middle elevations (below 1300 m), on all aspects often on coarse materials. Typical soils are Dystric Brunisols. Most common in Rocky Mountain Douglas-fir subzone.	lodgepole pine, (Rocky Mountain Douglas-fir); J	lodgepole pine, western hemlock, western red cedar; J	western hemlock, (western red cedar); L	Slow to normal
	Clearcut logging, clearing or fire	Low to middle elevations (below 1300 m), on all aspects. Typical soils Humo-Ferric Podzols. Most common in Rocky Mountain Douglas-fir subzone.	Rocky Mountain Douglas-fir, (western white pine), (common paper birch); H K	Rocky Mountain Douglas-fir, western hemlock, western red cedar; K	western hemlock, (western red cedar); L	Normal
	Clearcut logging, selective logging or clearing	Middle elevations (1100-1300 m), on north to east aspects subject to cold air drainage. Typical soils Humo-Ferric Podzols. Most common in lodgepole pine - Engelmann spruce - alpine fir subzone.	alpine fir, Engelmann spruce, (western hemlock); I L	alpine fir, western hemlock; I L	western hemlock, (western red cedar); L	Fast
	Clearcut logging or selective logging	Low to middle elevations (below 1300 m), on all aspects. Typical soils Humo-Ferric Podzols. Most common in Rocky Mountain Douglas-fir subzone.	western hemlock, (western red cedar); H L	western hemlock, (western red cedar); L	western hemlock, (western red cedar); L	Fast
	Any disturbance that does not affect the watertable	Low to middle elevations (below 1300 m), on all aspects, often receiving seepage. Typical soils Sombric Humo-Ferric Podzols. Most common in Rocky Mountain Douglas-fir subzone.	western red cedar, (western hemlock); L	western red cedar, (western hemlock); L	western red cedar[2]; L	Normal

[1] Species in brackets may or may not be present. The upper case circled letters and colours correspond with broad vegetation groups as described in this chapter.

[2] This sequence influenced by seepage may be found in the Salmon Arm Section also.

TABLE 3.3 (Continued)

ZONE	TYPE OF DISTURBANCE	LANDSCAPE FEATURES	SUCCESSIONAL STAGE - DOMINANT VEGETATION; BROAD VEGETATION GROUP[1]			RATE OF SUCCESSION
			YOUNG SERAL OR CLIMAX ⟶		MATURE CLIMAX	
Subalpine Engelmann spruce - alpine fir zone (SAeS-alF)	Fire	High elevations (1300-1900 m), on all aspects, often on coarse material. Typical soils Humo-Ferric Podzols. Most common in lodgepole pine - whitebark pine subzone.	lodgepole pine; (I)	lodgepole pine, Engelmann spruce, alpine fir; (I)	Engelmann spruce, alpine fir; (M)	Normal
	Clearcut logging, selective logging or clearing	High elevations (1300-1900 m), on all aspects. Typical soils Humo-Ferric Podzols. Most common in lodgepole pine - whitebark pine subzone.	Engelmann spruce, alpine fir; (M)	Engelmann spruce, alpine fir; (M)	Engelmann spruce, alpine fir; (M)	Fast

[1] Species in brackets may or may not be present. The upper case circled letters and colours correspond with broad vegetation groups as described in this chapter.

chapter four

VEGETATION INTERPRETATIONS

4. VEGETATION INTERPRETATIONS

The following interpretations for wildlife, forestry and recreation are based on subjective assessment of collected information and the results of the data analysis. The information is intended only for planning purposes. For on-site management and allocation of resources, the data can be assessed more precisely. Interpretive values of landscapes will change as the vegetation changes with time.

4.1 VEGETATION AND WILDLIFE

4.1.1 Regional Perspective

These are general comments relating suitable habitat and distribution of selected mammals within the study area (Low, pers. comm.).

Mule deer populations are high in the Vernon Section and moderate in the Salmon Arm Section. Snow depths limit numbers in the Trout Lake Section (snow depths greater than 50 cm are limiting for the younger members of the population). Preferred habitat for deer are ponderosa pine and Rocky Mountain Douglas-fir forests, found in the hills around Vernon, Armstrong, Salmon Arm, Falkland and Westwold.

Moose are most common in the western part of the project area in the Vernon and Salmon Arm Sections. Populations are known from Bolean Lake, White Lake, McGillivray Lake, Hyas Lake, Monte Hills, Paxton Valley, Salmon River Valley, Chapperon Creek, north of Barton Hill, Charcoal Creek and Wap River Valley. Suitable habitats are lakes with aquatic plants, streams with willow thickets and uplands with young trembling aspen and willow cover.

Sheep are limited in distribution being confined to the Vernon Section. Populations are recorded for Shorts Creek, Whiteman Creek, Chase to Phillips Lake and over to Squilax. Preferred habitat is dry grasslands with associated rock outcrops (extensive native grasslands are not found in the Salmon Arm and Trout Lake Sections).

Caribou have limited populations in the Trout Lake Section, confined to the uplands south of Malakwa and the Monashee Mountains. Historical records indicate a herd once inhabited the Hunter Range. Caribou use a variety of habitats throughout the year including mature coniferous forests with sufficient lichen loads in winter, low elevation spring range with succulent plant growth and open alpine tundra during summer and parts of winter.

TABLE 4.1
LIST OF VEGETATION TYPE NAMES[1]

1. Western hemlock - western red cedar - western yew - blue-bead clintonia
2. Western hemlock - western red cedar - unifoliate-leaved foamflower - oak fern
3. Western hemlock - alpine fir - black blueberry - blue-bead clintonia
4. Western hemlock - western red cedar - devil's-club - common lady fern
5. Alpine fir - bracted lousewort - broad-leaved arnica - Sitka valerian
6. Alpine fir - black blueberry - grouseberry - broad-leaved arnica
7. Alpine fir - white-flowered rhododendron - black blueberry - Sitka valerian
8. Alpine fir - white-flowered rhododendron - five-leaved creeping raspberry
9. Alpine fir - Sitka mountain-ash - blue-bead clintonia - oak fern
10. Lodgepole pine - common juniper - pine grass - subalpine fleabane
11. Lodgepole pine - alpine fir - black blueberry - blue-bead clintonia
12. Lodgepole pine - alpine fir - black blueberry - violets
13. Rocky Mountain Douglas-fir - alpine fir - Oregon boxwood - Canadian bunchberry
14. Lodgepole pine - alpine fir - Oregon boxwood - one-sided wintergreen
15. Needle-and-thread grass - drooping brome grass - beardless bluebunch wheat grass
16. Ponderosa pine - common snowberry - Sandberg's blue grass - Columbia gromwell
17. Ponderosa pine - common snowberry - beardless bluebunch wheat grass
18. Rocky Mountain Douglas-fir - common snowberry - birch-leaved spirea - pine grass
19. Lodgepole pine - common juniper - pine grass - kinnikinnick
20. Rocky Mountain Douglas-fir - common saskatoon - pine grass - racemose pussytoes
21. Rocky Mountain Douglas-fir - ponderosa pine - tall Oregon-grape - pine grass
22. Rocky Mountain Douglas-fir - birch-leaved spirea - pine grass - showy aster
23. Lodgepole pine - Oregon boxwood - pine grass - showy aster
24. Rocky Mountain Douglas-fir - roses - pine grass - showy aster
25. Lodgepole pine - Oregon boxwood - showy aster - heart-leaved arnica
26. Rocky Mountain Douglas-fir - common paper birch - birch-leaved spirea - large-leaved rattlesnake orchid
27. Trembling aspen - willows - pine grass - western meadowrue
28. Rocky Mountain Douglas-fir - tall Oregon-grape - pine grass - showy aster
29. Rocky Mountain Douglas-fir - western hemlock - Oregon boxwood - one-sided wintergreen
30. Rocky Mountain Douglas-fir - Oregon boxwood - common western pipsissewa - large-leaved rattlesnake orchid
31. Rocky Mountain Douglas-fir - western hemlock - black blueberry - blue-bead clintonia
32. Common paper birch - western red cedar - Oregon boxwood - rough-fruited fairybells
33. Western red cedar - Oregon boxwood - birch-leaved spirea - large-leaved rattlesnake orchid
34. Trembling aspen - fireweed - Canadian bunchberry
35. Western larch - western red cedar - soopolallie - northern twinflower
36. Common paper birch - western red cedar - Oregon boxwood - blue-bead clintonia
37. Western larch - western red cedar - Oregon boxwood - common western pipsissewa
38. Rocky Mountain Douglas-fir - western hemlock - Oregon boxwood - northern twinflower
39. Rocky Mountain Douglas-fir - western hemlock - black blueberry - rough-fruited fairybells
40. Rocky Mountain Douglas-fir - western red cedar - Oregon boxwood - western bracken
41. Common paper birch - western red cedar - western thimbleberry - trailflower
42. Alpine fir - subalpine fleabane - sedges - smooth woodrush
43. Sandberg's blue grass - yellow salsify - beardless bluebunch wheat grass
44. Western thimbleberry - fireweed - oak fern
45. Black blueberry - Sitka valerian - green false hellebore - oak fern

[1] To be used in conjunction with Tables 4.2 to 4.5.

Mountain goats have a limited distribution in the Trout Lake Section, being reported in the Park Range and the Mabel Range. Preferred habitats vary from summer to winter. During the summer mountain goats inhabit cirque basins with associated snow patches and late summer emergent vegetation. During the winter, mountain goats move into mature forests associated with steep slopes and aspects with low snow accumulations and high insolation values.

Black bear are found occasionally in the Dry Interior Region and commonly throughout the Interior Wet Belt Region. Higher numbers are associated with the Trout Lake Section where food production is more abundant. Preferred habitats are early successional stages of vegetation, often recently logged sites, avalanche tracks and burnt areas with an adequate food supply.

Grizzly bear are most common in the Trout Lake Section with populations recorded in the Hunter Range, Park Range, Sawtooth Range, Mount Fosthall area and Monashee Pass. Preferred habitats are non-coniferous avalanche tracks, moist krummholz and alpine tundra sites.

The vegetation types that were not sampled in this study may be particularly significant for certain animal species. Within the Vernon Section, floodplains may be utilized as moose winter range; wetlands, specifically marsh and lake edges and swamps, are used by moose for summer range; and low elevation rock outcrops (associated with grasslands) are used as escape terrain by sheep and mule deer and for lambing by sheep. In the Salmon Arm and Trout Lake Sections floodplains are used as moose and deer winter range; marsh and lake edges and swamps are utilized as moose summer range and rock outcrops with open Rocky Mountain Douglas-fir forests are used as winter and spring escape terrain by mountain goats.

4.1.2 Interpretations

Table 4.2 presents interpretations of the vegetation types for the wildlife species previously discussed. Many of the interpretations have evolved from methodologies developed by Thomas et al (1980). Table 4.1 is a list of vegetation type numbers and associated vegetation type names. The bar graphs illustrate the relationship between animal abundance and available food supply. Also included are management recommendations, ratings of range values for specified species, factors limiting biological productivity and habitat manipulation potential ratings. Management practices on specific sites will vary according to environmental factors such as slope, soil depth and texture, drainage, aspect and nature of vegetative cover. The interpretations are defined as follows:

Management Prescription:

These are suggested treatments to accomplish short term and long term habitat improvement for selected mammals considering site sensitivity and environmental conditions. Vegetation types not given management prescriptions are best suited for wildlife use in their present condition or have very low potential habitat values as will be evident from the ratings.

Range Values:

Ratings of low, moderate or high are given for the wildlife species utilizing the present vegetative cover. Factors considered are amount of food, quality of food, shelter and escape terrain.

Limiting Factors:

These are habitat conditions which have a detrimental effect on use by wildlife. Factors considered are lack of shelter, available food supply, quality of forage, climate and snow depth.

Habitat Manipulation Potential:

Each vegetation type is given a low, moderate or high rating for the potential to produce a desirable wildlife habitat. Parameters considered are shrub and herb competition, rate of succession, present and potential vegetation, water availability, soil conditions, slope, aspect, nutrient supply and potential site degradation. The fact that a vegetation type may already be of optimum use for wildlife is not considered. Only the potential for manipulation, in the event of undesirable changes in a habitat, is considered.

4.2 VEGETATION AND FORESTRY

4.2.1 Regional Perspective

Within the Vernon Section forests develop and grow very slowly. Low precipitation and associated moisture deficits severely limit forest productivity. Many sites, particularly steep south- and west-facing slopes, will not produce trees once they have been cleared or logged. High soil and near-surface air temperatures inhibit conifer germination and seedling survival. In areas of fine-textured soil, slumping and surface erosion may occur following removal of the vegetative cover. The most productive forests in the Vernon Section are the high elevation Rocky Mountain Douglas-fir and subalpine forests. In these environments precipitation is not as limiting although soil erosion problems may result after logging.

In the Salmon Arm Section precipitation does not limit forest productivity except on south and west aspects. On these sites regeneration of conifers may not occur readily. On level sites and other aspects regeneration of conifers may occur naturally. In areas where seepage is present brush species such as willows, alders and American red raspberry may grow faster than regenerating conifers. At higher elevations (above 1000 m) runoff from snowpacks may cause erosion of fine-textured soils. Sites receiving seepage are the most productive for forestry with western red cedar, Rocky Mountain Douglas-fir and western white pine often growing at rapid rates.

The most productive forests are found in the Trout Lake Section. However, high precipitation often creates forest management problems. Excessive available moisture may result in dense shrub production which retards conifer establishment. Heavy precipitation and high snowpacks can cause slumping and soil erosion throughout the Section. Adequate site preparation after logging and careful road location, design and maintenance are necessary to prevent these problems. Forests throughout the Section are productive on deep soils.

4.2.2 Interpretations

The interpretations in Table 4.3 can be applied within the study area to assess sites for regeneration potential, regeneration species suitability, windthrow hazard, fire hazard potential, and brush competition. Comments are given on particular forestry aspects of each vegetation type. The interpretations are defined as follows:

Regeneration Potential:

Ratings of low, moderate or high are given for the potential of coniferous trees to survive from a seedling stage. Assessed factors are nutrient status, moisture availability, soil depth and texture, climate, slope, aspect, rate of succession and surface temperatures.

Regeneration Species Suitability:

The trees best-suited to the environmental conditions of each vegetation type are listed (limited to two species). Conditions considered are the same as those for regeneration potential. No consideration was given to deciduous species, and white pine was not considered because of susceptibility to white pine blister rust. If desired, suitability for deciduous species may be determined from the vegetation type descriptions.

TABLE 4.2
SELECTED INTERPRETATIONS FOR SELECTED MAMMALS
Interpretations assessed in cooperation with Dave Low, Fish and Wildlife Branch

BROAD VEG. GROUP	VEG.[1] TYPE	ANIMAL ABUNDANCE RELATIVE TO AVAILABLE FOOD SUPPLY		INTERPRETIVE COMMENTS	HABITAT MANIPULATION POTENTIAL
		ANIMAL SPECIES	ANIMAL ABUNDANCE[2] L M H		
A	15	sheep deer		Burning may improve short-term productivity; moderate spring range values for deer and sheep, high winter range values for sheep; low food availabilty and lack of shelter are limiting factors (may be subject to invasion by big-basin sagebrush and knapweed with overgrazing).	Low
	43	sheep deer		Burning may improve short-term productivity; moderate spring range values for deer and sheep, high winter range values for sheep; low food availability and lack of shelter are limiting factors (may be subject to invasion by big-basin sagebrush and knapweed with overgrazing).	Low
	16	deer		Maintain tree canopy cover between 10 and 30%; moderate spring range values and low winter range values for deer; lack of shelter is a limiting factor.	Low
	17	deer sheep		Maintain tree canopy cover between 15 and 40%; moderate spring and winter range values for deer, moderate spring and fall range values for sheep; low available food supply is a limiting factor.	Moderate
B	10	deer		Burn rotation of 20 to 40 years may increase shrub productivity[3]; low fall and mild winter range values for deer; low available food supply and snow depth are limiting factors.	Low
C	27	sheep deer moose		Repeated burning to convert to grass community; moderate spring and fall range values for sheep, when associated with sheep winter range, moderate fall range for deer and moose; lack of shelter is a limiting factor.	High
D	20	deer		Reduce tree canopy cover to 20 to 40% on south aspects and to 40 to 60% on north aspects, burn rotation 20 to 30 years[3]; moderate spring and winter range values for deer; low available food supply is a limiting factor.	Moderate
	18	deer		Maintain tree canopy cover to provide shelter for deer; no range values; low available food supply is a limiting factor.	Low
	21	deer		Maintain 30% tree canopy cover, burn rotation 15 to 40 years[3]; high spring and winter range values for deer; tree regeneration is a limiting factor.	High

[1] Vegetation types are arranged as per analysis (see Figure 3.1). The type names are presented in Table 4.1.

[2] L, M and H represent low, moderate and high abundances respectively.

[3] Short rotation for light burns and long rotation for high-intensity burns (high-intensity burns may occur as a result of delayed burn rotations, due to heavy fuel accumulations).

TABLE 4.2 (Continued)

BROAD VEG. GROUP	VEG.[1] TYPE	ANIMAL ABUNDANCE RELATIVE TO AVAILABLE FOOD SUPPLY		INTERPRETIVE COMMENTS	HABITAT MANIPULATION POTENTIAL
		ANIMAL SPECIES	ANIMAL ABUNDANCE[2] L M H		
E	25	deer	———	Maximize edge effect; high fall and moderate winter range values for deer; low available food supply is a limiting factor.	High
	26	deer	———	Clearcut to maximize edge effect; high fall and early winter range values for deer; low available food supply and snow depth are limiting factors.	High
	28	deer moose	——— ———	Reduce tree canopy cover to 10 to 20%; high fall range values for deer and high winter range values for moose; low available food supply and snow depth are limiting factors.	High
	23	deer moose	—— ——	Clearcut to maximize edge effect; moderate fall and winter range values for deer and moose; snow depth is a limiting factor for deer, low available food supply for deer and moose.	Moderate
	24	deer	——	Maintain old growth tree system; moderate fall range values for deer; snow depth is a limiting factor.	Low
	22	deer moose	— —	Maintain old growth tree system; low to moderate fall range values for deer, low winter range values for moose; snow depth is a limiting factor for deer and steepness of slope for moose.	Low
F	30	deer moose	— —	Clearcut to maximize edge effect; very low use potential for deer and moose; low available food supply and snow depth are limiting factors.	Low
	33	deer moose	— —	No management prescription; very low use potential for deer and moose; low available food supply and snow depth are limiting factors.	Low
	32	deer	——	Clearcut to maximize edge effect; moderate fall and mild winter range values for deer on south-east and west aspects; low available food supply and snow depth are limiting factors.	Moderate
	36	deer moose	— ——	Maintain 10 ha blocks for shelter; low summer and fall range values for deer, moderate ver summer and fall range values for moose; low available food supply and snow depth are limiting factors.	Low
G	19	deer	——	Clearcut lodgepole pine, maintain old growth; Rocky Mountain Douglas-fir; moderate fall and mild winter range for deer; snow depth is a limiting factor.	Moderate

[1] Vegetation types are arranged as per analysis (see Figure 3.1). The type names are presented in Table 4.1.

[2] L, M and H represent low, moderate and high abundances respectively.

TABLE 4.2 (Continued)

BROAD VEG. GROUP	VEG.[1] TYPE	ANIMAL ABUNDANCE RELATIVE TO AVAILABLE FOOD SUPPLY		INTERPRETIVE COMMENTS	HABITAT MANIPULATION POTENTIAL
		ANIMAL SPECIES	ANIMAL ABUNDANCE[2] L M H		
H	44	caribou black bear grizzly bear		Thinning at 10 to 20 years (high forage production relative to logging); high forage values for black and grizzly bear, moderate spring and early winter range values for caribou; lack of shelter and snow depth are limiting factors.	High
	34	deer black bear		Maintain present vegetative cover (high forage production relative to logging); high summer and fall range values for deer, high forage values for black bear; lack of shelter and snow depth are limiting factors.	High
I	11	deer moose black bear		Clearcut lodgepole pine to maximize edge effect; moderate summer range values for deer, moderate fall range values for moose, moderate forage values for black bear; snow depth is a limiting factor.	Moderate
	12	deer moose black bear grizzly bear		Clearcut to maximize edge effect; moderate fall range values for deer and moose, moderate forage values for black and grizzly bear; snow depth is a limiting factor.	Moderate
	14	deer moose black bear		No management prescription; very low range and forage values for selected mammals; cold climate, short growing season and snow depth are limiting factors.	Low
	13	deer moose black bear		No management prescription; very low range and forage values for mammals; cold climate short growing season and snow depth are limiting factors.	Low
J	40	deer black bear		Clearcut on short-term rotation, maintain 20% canopy cover on long-term rotation (100 to 140 years) for shelter; moderate fall and mild winter range values for deer, high forage values for black bears; snow depth is a limiting factor.	High
	37	deer black bear		No management prescription; very low range and forage values for mammals; low available food supply, rapid tree regeneration and snow depth are limiting factors.	Low
	35	deer black bear		No management prescription; low summer and fall range values for deer, moderate forage values for black bear; low quality of available food supply and snow depth are limiting factors.	Low

[1] Vegetation types are arranged as per analysis (see Figure 3.1). The type names are presented in Table 4.1.

[2] L, M and H represent low, moderate and high abundances respectively.

TABLE 4.2 (Continued)

BROAD VEG. GROUP	VEG.[1] TYPE	ANIMAL ABUNDANCE RELATIVE TO AVAILABLE FOOD SUPPLY		INTERPRETIVE COMMENTS	HABITAT MANIPULATION POTENTIAL
		ANIMAL SPECIES	ANIMAL ABUNDANCE[2] L M H		
K	41	deer black bear		Clearcut on short-term rotation; moderate year-round range values for deer, low forage values for black bear; low available food supply and snow depth are limiting factors.	Moderate
	39	deer black bear		Clearcut on short-term rotation; moderate year-round range values for deer, moderate forage values for black bear; low available food supply and snow depth are limiting factors.	Moderate
	38	deer black bear		No management prescription; low fall and winter range values for deer, moderate forage values for black bear; snow depth is a limiting factor.	Low
	29	deer black bear		Clearcut on short-term rotation, maintain 20% canopy cover on long-term rotation; moderate year-round range values for deer except for heavy-snow winters, moderate forage values for black bear; snow depth is a limiting factor.	High
	31	deer black bear		Clearcut on sort-term rotation, maintain 20% canopy cover on long-term rotation; moderate year-round range values for deer except for heavy-snow winters, moderate forage values for black bear; snow depth is a limiting factor.	High
L	1	moose caribou black bear grizzly bear		Clearcut to maximize edge effect; low fall and winter range values for moose, low forage values for black and grizzly bear (high when logged), low spring and early winter range values for caribou; low available food supply and snow depth are limiting factors.	High
	2	moose caribou black bear grizzly bear		Clearcut to maximize edge effect; low fall and mild winter range values for moose, moderate spring and early winter range values for caribou, moderate forage values for black and grizzly bear; low available food supply and snow depth are limiting factors.	High
	3	black bear		Clearcut to maximize edge effect; moderate forage values for black bear; low available food supply and snow depth are limiting factors.	High
	4	caribou black bear		Clearcut to maximize edge effect; low early winter range values for caribou if adjacent to dry sites, moderate forage values for black bear if adjacent to dry sites; low available food supply and snow depth are limiting factors.	High

[1] Vegetation types are arranged as per analysis (see Figure 3.1). The type names are presented in Table 4.1.

[2] L, M and H represent low, moderate and high abundances respectively.

TABLE 4.2 (Continued)

BROAD VEG. GROUP	VEG.[1] TYPE	ANIMAL ABUNDANCE RELATIVE TO AVAILABLE FOOD SUPPLY		INTERPRETIVE COMMENTS	HABITAT MANIPULATION POTENTIAL
		ANIMAL SPECIES	ANIMAL ABUNDANCE[2] L M H		
M	45	deer caribou		No management prescription; low summer and fall range values for deer, low late spring and fall range values for caribou; lack of shelter and snow depth are limiting factors.	Low
	7	caribou grizzly bear		Clearcut on long-term rotation (productive for caribou when older than 150 years); low late summer range values for caribou, low forage values for grizzly bear; snow depth is a limiting factor.	Low
	9	caribou grizzly bear		Clearcut on long-term rotation; moderate early summer and winter range values for caribou, low forage values for grizzly bear; snow depth is a limiting factor.	Low
	8	caribou grizzly bear		Clearcut on long-term rotation; low early summer and winter range values for caribou, low forage values for grizzly bear; snow depth is a limiting factor.	Low
	6	caribou grizzly bear		Clearcut on long-term rotation; moderate winter ranges values for caribou, low forage values for grizzly bear; snow depth is a limiting factor.	Low
N	5	caribou mountain goat grizzly bear		No management prescription; high summer range values for caribou and goats, high summer range values for grizzly bear; snow depth is a limiting factor (except on windblown ridges or areas of high insolation values).	Low
	42	caribou mountain goat grizzly bear		No management prescription; high summer range values for caribou and goats, high summer range values for grizzly bear; snow depth is a limiting factor (except on windblown ridges or areas of high insolation values).	Low

[1] Vegetation types are arranged as per analysis (see Figure 3.1). The type names are presented in Table 4.1.

[2] L, M and H represent low, moderate and high abundances respectively.

Brush Competition:

Ratings of low, moderate and high are given for the potential degree to which shrub species can out compete regenerating conifers. Elements considered are nutrient status, moisture availability, present and potential soil conditions, present and potential vegetation, slope, aspect and rate of succession.

Windthrow Hazard:

Each vegetation type is rated low, moderate or high for potential uprooting of trees by wind. Factors considered are soil depth, soil texture, soil cohesion, depth of water table, species rooting depth, stand ages, stand structure, slope, aspect and exposure.

Fire Hazard:

Ratings of low, moderate and high for fire potential are based on fuel loading and imflammability (Harcombe, 1977). Fuel loading relates to density and stem diameters of shrub and herb layers and amount of wood on the ground. Inflammability is based on the ability of material to ignite, considering fuel sizes and general moisture conditions as determined from climate, slope, aspect and the nature of the fuel.

4.3 VEGETATION AND RECREATION

4.3.1 Regional Perspective

The vegetation of the Vernon map sheet area displays a wide diversity of plants adapted to dry (Vernon Section) and wet environments (Salmon Arm and Trout Lake Sections). The visual diversity associated with variation in vegetation makes the study area attractive for many recreational activities. Some visual characteristics of the vegetation were assessed and described for the Spallumcheen Municipality (Resource Analysis Branch, 1975).

Within the Vernon Section the valley bottoms are a mosaic of grasslands, ponderosa pine and Rocky Mountain Douglas-fir. These contrasting habitats produce a striking visual environment.

Recreational use of many sites within the Vernon Section is limited because of lack of plant cover and sensitivity of vegetation to human foot traffic (Block and Hignett, 1978). This is especially true on steep south- and west-facing slopes. In the grasslands there are some unique plants to be found (brittle prickly-pear cactus, sagebrush mariposa lily and bitterroot lewisia) and during the spring hillsides are often covered with a yellow array of arrow-leaved balsamroot.

TABLE 4.3
SELECTED INTERPRETATIONS FOR FORESTRY

BROAD VEG. GROUP	VEGETATION[1] TYPE	REGENERATION[2]		BRUSH COMPETITION	WINDTHROW HAZARD	FIRE HAZARD	INTERPRETIVE COMMENTS
		POTENTIAL	SPECIES SUITABILITY				
A	15	Low	ponderosa pine	Low	Low	High	High moisture deficits and inflammable materials in summer, regenerating trees grow very slowly and often do not survive; high surface temperatures and competition for moisture with herbs interferes with regeneration.
	43	Low	ponderosa pine	Low	Low	High	High moisture deficits and inflammable materials in summer, regenerating trees grow very slowly and often do not survive; high surface temperatures and competition for moisture with herbs interferes with regeneration.
	16	Low	ponderosa pine, Rocky Mountain Douglas-fir	Low	Low	High	Steep[3], warm slopes, high moisture deficits in summer, regenerating trees may establish in shade of older trees; brush competition may be a minor problem.
	17	Low	ponderosa pine, Rocky Mountain Douglas-fir	Moderate	Low	High	Steep, warm slopes, high moisture deficits in summer, regenerating trees may establish in shade of older trees; brush competition may be a minor problem.
B	10	Moderate	lodgepole pine, Engelmann spruce, alpine fir	Moderate	Moderate	Moderate	Steep, high elevation slopes (above 1500 m) and shallow materials lower the regeneration potential.
C	27	Moderate	white spruce, Rocky Mountain Douglas-fir	High	Moderate	Moderate	Available moisture and nutrients, favour tree regeneration; brush competition may be high after clearing.
D	20	Low	Rocky Mountain Douglas-fir, lodgepole pine	Low	Low	Moderate	High moisture deficits and often steep slopes make it difficult for trees to regenerate.
	18	Moderate	Rocky Mountain Douglas-fir	Moderate	Low	Low	Moisture deficit in summer negligible on cool aspects, trees may establish easily; brush competition may be a problem.
	21	Low	Rocky Mountain Douglas-fir, ponderosa pine	Low	Moderate	High	High moisture deficits, and steep slopes make it difficult for trees to establish.

[1] Vegetation types are arranged as per analysis (see Figure 3.1). The type names are presented in Table 4.1.

[2] Regeneration is defined as the potential of tree seedlings to survive.

[3] Steep slopes are not as such a problem; soil creep, rapid runoff and solar radiation associated with steep slopes are factors limiting regeneration of trees.

TABLE 4.3 (Continued)

BROAD VEG. GROUP	VEGETATION[1] TYPE	REGENERATION[2]		BRUSH COMPETITION	WINDTHROW HAZARD	FIRE HAZARD	INTERPRETIVE COMMENTS
		POTENTIAL	SPECIES SUITABILITY				
E	25	Moderate	lodgepole pine, Rocky Mountain Douglas-fir	Moderate	Moderate	Moderate	Steep, high elevation slopes (above 1500 m), with moderate moisture availability for most of the year.
	26	Low	Rocky Mountain Douglas-fir	Moderate	Low	Moderate	Hot, dry aspects and coarse-textured soils result in low regeneration potential.
	28	Low	Rocky Mountain Douglas-fir, lodgepole pine	Moderate	Low	Moderate	Steep slopes and south aspects make it difficult for trees to regenerate.
	23	Moderate	lodgepole pine, Rocky Mountain Douglas-fir	Moderate	Moderate	Low	Increased moisture associated with higher elevations results in moderate ratings for regeneration potential and brush competition.
	24	Low	Rocky Mountain Douglas-fir, lodgepole pine	Low	Low	Moderate	Steep slopes and south aspects with high amount of grass cover increase fire potential; regeneration of trees is slow due to increased solar radiation and high soil temperatures.
	22	Low	Rocky Mountain Douglas-fir, lodgepole pine	Low	Low	Moderate	Steep slopes and south aspects with high amount of grass cover increase fire potential; regeneration of trees is slow due to increased solar radiation and high soil temperatures.
F	30	Moderate	Rocky Mountain Douglas-fir, western red cedar	Moderate	Low	Low	Available moisture good for conifer regeneration; logging may release suppressed western red cedar.
	33	Moderate	Rocky Mountain Douglas-fir, western red cedar	Moderate	Low	Low	Conifer regeneration will be rapid on cool-shaded aspects; logging may release suppressed western red cedar.
	32	Moderate	Rocky Mountain Douglas-fir, western red cedar	High	Low	Low	Available moisture, cool aspects and fine-textured soils are factors increasing regeneration potential; associated with these factors after clearing may be high brush competition.
	36	Moderate	Rocky Mountain Douglas-fir, western red cedar	High	Low	Low	Available moisture, cool aspects and fine-textured soils are factors increasing regeneration potential; associated with these factors after clearing may be high brush competition.

[1] Vegetation types are arranged as per analysis (see Figure 3.1). The type names are presented in Table 4.1.

[2] Regeneration is defined as the potential of tree seedlings to survive.

TABLE 4.3 (Continued)

BROAD VEG. GROUP	VEGETATION[1] TYPE	REGENERATION[2]		BRUSH COMPETITION	WINDTHROW HAZARD	FIRE HAZARD	INTERPRETIVE COMMENTS
		POTENTIAL	SPECIES SUITABILITY				
G	19	Low	lodgepole pine, Rocky Mountain Douglas-fir	Low	Moderate	Moderate	Regeneration potential low due to aspect and slope; fire hazard moderate because of high percent grass cover.
H	44	High	Rocky Mountain Douglas-fir, western hemlock	High	Moderate	Low	High moisture availability results in increased regeneration potential and brush competition potential.
	34	Moderate	Rocky Mountain Douglas-fir	Moderate	Low	Low	Regeneration of conifers may be somewhat slow due to aspect and increased soil temperatures.
I	11	Moderate	lodgepole pine, alpine fir	High	Low	Moderate	High moisture availability and aspect increase brush competition potential.
	12	Low	lodgepole pine, alpine fir	Low	Low	Low	Low moisture availability and cool aspects limit regeneration potential.
	14	High	western hemlock, alpine fir	Moderate	Moderate	Low	High moisture availability and nutrient status increase regeneration potential.
	13	Moderate	alpine fir, Engelmann spruce	High	Low	Low	Cold air pooling limits growth of conifers, brush competition may be high.
J	40	High	Rocky Mountain Douglas-fir, western hemlock	High	Moderate	Low	High moisture availability increases regeneration potential and brush competition potential.
	37	High	Rocky Mountain Douglas-fir, western red cedar	High	Low	Low	High moisture availability, aspect and soil texture contribute to high regeneration potential.
	35	Moderate	Rocky Mountain Douglas-fir, lodgepole pine	Moderate	High	Moderate	Shallow soils and low moisture availability limit the regeneration potential.
K	41	High	Rocky Mountain Douglas-fir, western red cedar	High	Moderate	Low	High moisture availability, moderate slopes and warm aspects contribute to high regeneration potential.
	39	Moderate	Rocky Mountain Douglas-fir, western red cedar	Moderate	Low	Low	Moisture availability which is moderate, due to steep slopes, limits regeneration potential.
	38	Moderate	Rocky Mountain Douglas-fir, western red cedar	High	Moderate	Moderate	Regeneration potential moderate due to well-drained soils; higher moisture availability may result in high brush competition.

[1] Vegetation types are arranged as per analysis (see Figure 3.1). The type names are presented in Table 4.1.

[2] Regeneration is defined as the potential of tree seedlings to survive.

TABLE 4.3 (Continued)

BROAD VEG. GROUP	VEGETATION[1] TYPE	REGENERATION[2]		BRUSH COMPETITION	WINDTHROW HAZARD	FIRE HAZARD	INTERPRETIVE COMMENTS
		POTENTIAL	SPECIES SUITABILITY				
K	29	Moderate	Rocky Mountain Douglas-fir, western hemlock	Moderate	Low	Low	Low nutrient status, moderate moisture availability on cool shaded aspects.
	31	Moderate	Rocky Mountain Douglas-fir western hemlock	Moderate	Moderate	Low	Low nutrient status, moderate moisture availability on warm aspects.
L	1	High	western hemlock Rocky Mountain Douglas-fir	Moderate	High	Low	High moisture availability and nutrient availability results in high regeneration potential; decadent trees may be susceptible to windthrow.
	2	High	western hemlock alpine fir	High	High	Low	High moisture availability and nutrient availability results in high regeneration potential; brush competition may be high; decadent trees may be susceptible to windthrow.
	3	High	western hemlock alpine fir	High	High	Low	High moisture availability and nutrient availability results in high regeneration potential; brush competition may be high; decadent trees may be susceptible to windthrow.
	4	High	western red cedar western hemlock	High	High	Low	Very high moisture availability, brush competition may be a severe problem.
M	45	High	alpine fir Engelmann spruce	High	Low	Low	High moisture availability, gentle slopes, and fine-textured soils result in a high regeneration potential.
	7	High	alpine fir Engelmann spruce	High	Low	Low	Seepage often present, highly productive subalpine forests; regeneration potential and brush competition are high in response to moisture and nutrient enrichment.
	9	High	alpine fir Engelmann spruce	High	Low	Low	Seepage often present, highly productive subalpine forests; regeneration potential and brush competition are high in response to moisture and nutrient enrichment.
	8	High	alpine fir Engelmann spruce	Moderate	Low	Low	Slightly drier than previous types in this group, regeneration potential still high in response to available moisture.
	6	Moderate	alpine fir	Moderate	Moderate	Moderate	Exposure and shallow soils, effectively limit available moisture.

[1] Vegetation types are arranged as per analysis (see Figure 3.1). The type names are presented in Table 4.1.

[2] Regeneration is defined as the potential of tree seedlings to survive.

TABLE 4.3 (Continued)

BROAD VEG. GROUP	VEGETATION[1] TYPE	REGENERATION[2]		BRUSH COMPETITION	WINDTHROW HAZARD	FIRE HAZARD	INTERPRETIVE COMMENTS
		POTENTIAL	SPECIES SUITABILITY				
N	5	Low	alpine fir	Low	Moderate	Moderate	Climatic effects associated with high elevation and thick sod layer (above 1750 m) severely limit the potential for conifer tree regeneration.
	42	Low	alpine fir	Low	Low	Low	Climatic effects associated with high elevation and thick sod layer (above 1750 m) severely limit the potential for conifer tree regeneration.

[1] Vegetation types are arranged as per analysis (see Figure 3.1). The type names are presented in Table 4.1.

[2] Regeneration is defined as the potential of tree seedlings to survive.

Nuisance plants are not widespread although patches of poison-ivy and brittle prickly-pear cactus occur sporadically. Edible plants occur in limited quantities with only common saskatoon, tall Oregon-grape and roses providing a source.

In portions of the Salmon Arm Section and more so in the Trout Lake Section, very old (over 200 years) western red cedar and western hemlock trees present striking scenes of primeval-like forests. The presence of devil's-club and thick carpets of moss enhance the visual attractiveness of these sites.

In these Sections the limiting factor for recreational use is often a dense shrub layer which impedes mobility of hikers. Columbia lily is often found adorning dry wooded slopes and native orchids such as twayblades, large-leaved rattlesnake orchid, western coralroot and fairyslipper can be seen beneath coniferous forests. Devil's-club, with its long spikes, is a prominant nuisance plant which is confined to seepage-receiving sites. Other nuisance plants which may be encountered are roses, tall Oregon-grape, American red raspberry and currants. Black blueberry and red huckleberry often provide an abundant supply of edible berries; other plants producing edible fruits are American red raspberry, grouseberry, western thimbleberry and roses.

In all Sections of the study area, the krummholz subzone offers the most visually-striking scenes of vegetation. Here, where hiking terrain is generally excellent, for a brief period of the summer subalpine meadows display a profuse array of colours as the flowers bloom. Plants contributing to the scene are yellow glacier lily, Indian paintbrush, Merten's cassiope, red mountain-heather, lupines, subalpine fleabane, arnicas, subalpine buttercup and white globeflower. Overuse or improper use of these sites may lead to trampling of vegetation and subsequent soil erosion.

4.3.2 Interpretations

In Table 4.4 the vegetation types are interpreted for plant diversity, traffic tolerance (to human foot traffic), unique and rare plants, nuisance plants and edible plants. Interpretive comments are given for visual attractiveness and important recreational features.

The interpretive table can be used to assess the recreational vegetation values of sites within the study area. The interpretations are defined as follows:

Plant Diversity:

Low, moderate or high ratings, based on species composition and amount of cover, are assigned to each vegetation type.

Traffic Tolerance:

Ratings of low, moderate or high are given for each vegetation type and its tolerance for human foot-traffic use. Parameters considered are species composition, density of vegetation, resilience (all for shrub and herb layers), soil depth, slope and aspect (Block and Hignett, 1978).

Unique and Rare Plants:

Each vegetation type is assessed for the presence and abundance of rare or unique plants relative to the Region. Rare plants are those plants having limited occurrence in the Regions and unique plants are those having some feature or features of high botanical interest. Ratings are low, moderate or high.

Nuisance Plants:

Ratings of low, moderate or high are assigned to each vegetation type based on the presence and abundance of plants with spines, prickles, thorns or poisonous properties.

Edible Plants:

Low, moderate or high ratings are given dependent on the availability and abundance of easily recognized plants with edible parts. Most ratings are for plants with edible berries.

4.4 MISCELLANEOUS INTERPRETATIONS

4.4.1 Regional Perspective

Most of the lower elevation vegetation types of the Vernon Section have a low watershed management significance because of low precipitation. Only the high elevation (above 1500 m) forests, where snowpacks may be moderate, serve as water supply sources. Here rapid temperature increases in the spring may cause rapid melting of snowpacks. The sudden associated runoff of water can create severe erosion problems. The shade-providing canopies of this area are important in controlling runoff. Vegetation on many sites functions to control soil erosion, especially on steep slopes and areas of fine-textured soil. Revegetation after disturbance is often slow as a result of climatic moisture deficits and high soil and air temperatures. Conservation values are high for large portions of the Section because of associated high wildlife values. Forage values are consistently high in the grasslands and forests of ponderosa pine and Rocky Mountain Douglas-fir.

TABLE 4.4
SELECTED INTERPRETATIONS FOR RECREATION

BROAD VEG. GROUP	VEGETATION TYPE[1]	PLANT DIVERSITY	TRAFFIC TOLERANCE	UNIQUE AND RARE PLANTS	NUISANCE PLANTS	EDIBLE PLANTS	INTERPRETIVE COMMENTS
A	15	Low	Moderate	Moderate	Moderate	Low	May be visually attractive if combined with ponderosa pine forests; sagebrush mariposa lily may be common and brittle prickly-pear cactus may be abundant.
	43	Low	Moderate	Low	Low	Low	May be visually attractive if combined with ponderosa pine forests; vegetation is dominated by grasses; yellowbell fritillary may be frequent.
	16	Low	Low	Low	Low	Low	High visual attractiveness; grasses form the dominant vegetation; very steep slopes limit use potential.
	17	Low	Low	Low	Moderate	Moderate	High visual attractiveness; beardless bluebunch wheat grass may be the dominant herb; roses and common saskatoon have edible fruit.
B	10	Moderate	Moderate	Low	Low	Moderate	Low visual attractiveness; the thick herb layer is tolerant of human foot traffic; grouseberry and black blueberry have edible fruit.
C	27	High	Moderate	Moderate	Moderate	Moderate	High visual attractiveness especially in fall; American vetch and cream-coloured peavine are unique plants; roses, common saskatoon and nodding onion have edible parts.
D	20	Low	Low	Low	Low	Low	Moderate visual attractiveness with continuous layer of pine grass under mature Rocky Mountain Douglas-fir; low use potential because of steep slopes.
	18	Low	Low	Low	Low	Low	Moderate visual attractiveness with occasional ponderosa pine; shrub and herb layers sparse; low use potential because of north aspects.
	21	Moderate	Low	Low	Moderate	Moderate	Moderate visual attractiveness with occasional ponderosa pine; western fescue may be frequent; roses and common saskatoon have edible fruit.
E	25	Moderate	Moderate	Moderate	Low	Moderate	Low visual attractiveness; Columbia lily may be frequent; roses, black blueberry and soopolallie have edible fruit.
	26	Moderate	High	Low	Moderate	Moderate	Low visual attractiveness; sparse shrub and herb layers; tolerant of traffic because of gentle slope; tall Oregon-grape, roses and common saskatoon have edible fruit.
	28	Moderate	Low	Moderate	Moderate	Moderate	Moderate visual attractiveness with mixed coniferous and deciduous forests; bedstraw and trailplant may be frequent; common saskatoon and tall Oregon-grape have edible fruit.

[1] Vegetation types are arranged as per analysis (see Figure 3.1). The type names are presented in Table 4.1.

TABLE 4.4 (Continued)

BROAD VEG. GROUP	VEGETATION[1] TYPE	PLANT DIVERSITY	TRAFFIC TOLERANCE	UNIQUE AND RARE PLANTS	NUISANCE PLANTS	EDIBLE PLANTS	INTERPRETIVE COMMENTS
E	23	Low	Moderate	Low	Moderate	Moderate	Low visual attractiveness; dominant shrubs and herbs are soopolallie and pine grass; roses, tall Oregon-grape and common saskatoon have edible fruit.
	24	Low	Low	Low	High	Low	Low visual attractiveness; pine grass dominant cover; roses (may be dominant shrub) and tall Oregon-grape have edible fruit.
	22	Low	Low	Low	Moderate	Low	Low visual attractiveness; pine grass dominant cover on steep south aspects; roses and tall Oregon-grape have edible fruit.
F	30	Low	Moderate	Low	Low	Low	Moderate visual attractiveness with mixed coniferous and deciduous forests; dense shrub layers limit use potential.
	33	Low	High	Low	Low	Low	Low visual attractiveness; dense shrub layers dominated by western red cedar and steep slopes limit use potential.
	32	Low	High	Moderate	Low	Low	Moderate visual attractiveness with mixed coniferous and deciduous forests; western yew and rough-fruited fairybells may be frequent.
	36	Low	High	Low	Low	Low	Moderate visual attractiveness with mixed coniferous and deciduous forests; dense shrub layers dominated by western red cedar and Oregon boxwood limit use potential.
G	19	Moderate	Low	Moderate	Low	Moderate	Moderate visual attractiveness; common juniper, kinnikinnick and Columbia lily may be frequent; kinnikinnick and grouseberry have edible fruit.
H	44	High	Low	Moderate	Moderate	High	Very low visual attractiveness; sedges, horsetails, violets and fireweed may be frequent; edible plants which may dominate are western thimbleberry and American red raspberry.
	34	Moderate	Low	Low	Moderate	Moderate	Very low visual attractiveness; fireweed may dominate; western thimbleberry and American red raspberry have edible fruit.
I	11	High	Moderate	Moderate	Low	High	Moderate visual attractiveness; the thick shrub layer is dominated by Oregon boxwood and black blueberry; black blueberry and grouseberry have edible fruit
	12	Low	Moderate	Low	Low	High	Moderate visual attractiveness; the thick dwarf shrub layer is dominated by grouseberry; black blueberry and grouseberry have edible fruit.
	14	Moderate	Moderate	Low	Low	Moderate	Moderate visual attractiveness; open shrub and herb layers; black blueberry has edible fruit.

[1] Vegetation types are arranged as per analysis (see Figure 3.1). The type names are presented in Table 4.1.

TABLE 4.4 (Continued)

BROAD VEG. GROUP	VEGETATION[1] TYPE	PLANT DIVERSITY	TRAFFIC TOLERANCE	UNIQUE AND RARE PLANTS	NUISANCE PLANTS	EDIBLE PLANTS	INTERPRETIVE COMMENTS
I	13	Moderate	Moderate	Low	Low	Low	Moderate visual attractiveness; highly variable shrub and herb layers.
J	40	Moderate	High	Low	Low	Low	Moderate visual attractiveness; the open shrub layer is dominated by Oregon boxwood; red huckleberry has edible fruit.
	37	Low	High	Low	Low	Low	Low visual attractiveness; the closed shrub layer is dominated by western red cedar and Oregon boxwood.
	35	Moderate	High	Moderate	Low	Low	Low visual attractiveness; the closed shrub layer is dominated by soopolallie, western red cedar and Oregon boxwood; kinnikinnick and western fescue may be frequent.
K	41	High	Moderate	Moderate	Moderate	Low	Moderate visual attractiveness with mixed coniferous and deciduous forests; variable and diverse shrub and herb layers; wild sarsaparilla, trailplant and Columbia lily may be frequent.
	39	Moderate	Low	Low	Low	Moderate	Low visual attractiveness; Oregon boxwood may form a thick low shrub layer; black blueberry has edible fruit; wild ginger may occur occasionally.
	38	Moderate	High	Low	Low	Low	Low visual attractiveness; western red cedar dominates the shrub layers.
	29	Moderate	High	Low	Moderate	Moderate	Low visual attractiveness; western red cedar dominates the shrub layers; roses, tall Oregon-grape and black blueberry have edible fruit.
	31	Low	High	Low	Low	Low	Low visual attractiveness; western red cedar may form a continuous tall and low shrub layer.
L	1	Moderate	Moderate	Low	Low	Moderate	High visual attractiveness; shrub layers are sparse under closed mature tree canopy; black blueberry and red huckleberry have edible fruit.
	2	Moderate	Low	Low	Low	Low	High visual attractiveness; shrub layers are sparse under closed mature tree canopy; oak fern often dominates the herb layer; black blueberry has edible fruit.
	3	Moderate	Moderate	Low	Low	Moderate	High visual attractiveness; regenerating conifers dominate the shrub layers; black blueberry has edible fruit.
	4	High	Low	High	High	Moderate	High visual attractiveness; devil's-club often dominates the shrub layers; wild ginger and common lady fern may be frequent; red huckleberry and black blueberry have edible fruit.

[1] Vegetation types are arranged as per analysis (see Figure 3.1). The type names are presented in Table 4.1.

TABLE 4.4 (Continued)

BROAD VEG. GROUP	VEGETATION[1] TYPE	PLANT DIVERSITY	TRAFFIC TOLERANCE	UNIQUE AND RARE PLANTS	NUISANCE PLANTS	EDIBLE PLANTS	INTERPRETIVE COMMENTS
M	45	Moderate	Low	Low	Low	Moderate	Low visual attractiveness; shrub layers increasing in density with age; black blueberry and American red elder have edible fruit.
	7	High	High	Moderate	Low	High	Moderate visual attractiveness; white-flowered rhododendron may form a continuous shrub layer; black blueberry is an abundant plant with edible fruit.
	9	High	High	Low	Moderate	Moderate	Moderate visual attractiveness; white-flowered rhododendron and black blueberry are shrubs varying in abundance and prickly currants may be present.
	8	High	High	Low	Moderate	Moderate	Moderate visual attractiveness; white-flowered rhododendron and black blueberry are shrubs varying in abundance and prickly currants may be present.
	6	Low	High	Low	Low	High	Moderate visual attractiveness; white-flowered rhododendron and black blueberry form a continuous shrub layer; black blueberry is an abundant plant with edible fruit.
N	5	Moderate	Moderate	Moderate	Low	Low	High visual attractiveness especially in late summer when flowers are blooming; excellent hiking and viewing terrain.
	42	Moderate	Moderate	High	Low	Low	High visual attractiveness; especially in late summer when flowers are blooming; excellent hiking and viewing terrain.

[1] Vegetation types are arranged as per analysis (see Figure 3.1). The type names are presented in Table 4.1.

In the Salmon Arm and Trout Lake Sections the vegetation on many sites serves to regulate water storage in the form of snowpacks. Coniferous forests provide shade and allow slower melting rates and subsequent release of water. This is particularly true in the Salmon Arm Section, which has precipitation/snowpack characteristics of the Interior Wet Belt and warm spring temperatures typical of the Dry Interior. This runoff control is important for water supply and erosion control. Soil erosion control by plant cover is variable with highest values associated with vegetation on steep slopes, easily eroding soils and sites receiving seepage. Following disturbance most sites revegetate rapidly. Revegetation problems occur on steep slopes with south and west aspects and sites with shallow or very coarse soils. High conservation values exist for old western red cedar - western hemlock forests and the krummholz - alpine environment. Most sites have low values for forage productivity because of shading by tree canopies.

4.4.2 Interpretations

Many additional vegetation values can be assessed. Some of the more significant are presented in Table 4.5. Ratings are given for watershed significance, soil erosion control, revegetation after disturbance, conservation value and grazing/forage productivity (oriented to agricultural use). The interpretive comments highlight specific values of each vegetation type. The interpretations are defined as follows:

Watershed Significance:

Vegetation types are assessed for their significance in water supply management. The importance of the vegetation type in its relationship with hydrology (total yield of water and run-off regime) is considered. Factors assessed are soil depth and texture, type and abundance of vegetative cover, climate, slope, aspect, snow depth, duration of snow, precipitation regime and run-off regime.

Soil Erosion Control:

An analysis of effectiveness of vegetation for controlling surface erosion is made. Ratings are low, moderate or high. Factors considered are amount and type of vegetative cover, soil conditions, surface run-off regime, amount and regime of precipitation, snow depth, climate, aspect, slope and elevation.

Revegetation After Disturbance:

Vegetation types are rated for the ability to reestablish vegetation after logging, clearing or burning. Ratings are low, moderate or high. Environmental elements considered are present and

potential vegetation, nutrient status, moisture availability, soil depth and texture, climate, slope, aspect, rate of succession and surface temperature.

Conservation Value:

Each vegetation type is rated low, moderate or high for its conservation value. Factors which contribute to preservation value are presence of rare plants, scarcity of similar vegetation within the study area and high use values.

Forage Productivity:

An assessment of each vegetation type is made for present agricultural grazing and browse productivity. Ratings are low, moderate or high. Parameters considered are quantity and quality of herb and shrub vegetation, growing season, precipitation, soil conditions, slope, aspect and elevation.

TABLE 4.5
MISCELLANEOUS INTERPRETATIONS

BROAD VEG. GROUP	VEGETATION TYPE[1]	WATERSHED SIGNIFICANCE	SOIL EROSION CONTROL	REVEGETATION AFTER DISTURBANCE	CONSERVATION VALUE	FORAGE PRODUCTIVITY	INTERPRETIVE COMMENTS
A	15	Low	High	Low	High	High	Fine-textured soils on steep slopes will erode easily without vegetative cover; slow to revegetate after disturbance - prone to invasion by weeds; high forage values.
	43	Low	Moderate	Low	High	High	Slow to revegetate after disturbance; high forage and wildlife values.
	16	Low	High	Low	High	Moderate	Fine-textured soils on steep slopes will erode easily without vegetative cover; high forage and wildlife values.
	17	Low	High	Low	High	Moderate	Fine-textured soils on steep slopes will erode easily without vegetative cover; high forage and wildlife values.
B	10	High	Moderate	Moderate	Low	Moderate	High-elevation dry sites, significant for watershed management and soil erosion control; moderate forage values.
C	27	Moderate	Low	High	Moderate	Moderate	Fine-textured soils in draws may be susceptible to erosion if cleared; revegetates easily after disturbance; high forage and wildlife values.
D	20	Low	Low	Moderate	Moderate	Moderate	May be slow to revegetate depending on aspect; moderate forage and wildlife values.
	18	Low	Low	Moderate	Low	Low	Cool north aspects, will revegetate easily after disturbance; low forage and wildlife values.
	21	Moderate	High	Low	High	High	Fine-textured soils on steep slopes will erode easily without vegetative cover; high forage and wildlife values, good native grass production.
E	25	Moderate	Moderate	Moderate	Moderate	Moderate	Highly variable slopes at high elevations; moderate forage and wildlife values.
	26	Low	Low	Moderate	Moderate	Moderate	Coarse-textured soils may be slow to revegetate after disturbance; moderate forage and wildlife values.
	28	Low	Moderate	Moderate	High	Moderate	Fine-textured soils may be prone to erosion without vegetative cover; moderate forage values and high wildlife values.

[1] Vegetation types are arranged as per analysis (see Figure 3.1). The type names are presented in Table 4.1.

TABLE 4.5 (Continued)

BROAD VEG. GROUP	VEGETATION TYPE[1]	WATERSHED SIGNIFICANCE	SOIL EROSION CONTROL	REVEGETATION AFTER DISTURBANCE	CONSERVATION VALUE	FORAGE PRODUCTIVITY	INTERPRETIVE COMMENTS
E	23	Moderate	Moderate	Moderate	Moderate	High	Fine-textured soils may be prone to erosion without vegetative cover; high forage values and moderate wildlife values.
	24	Moderate	High	Low	Moderate	High	Fine-textured soils on steep slopes will erode easily without vegetative cover; high forage values and moderate wildlife values.
	22	Moderate	High	Low	Moderate	High	Fine-textured soils on steep slopes will erode easily without vegetative cover; high forage values and moderate wildlife values.
F	30	Moderate	Low	Moderate	Low	Low	Very sparse vegetation under closed tree canopies; low forage and wildlife values.
	33	Moderate	Moderate	Moderate	Low	Low	Very sparse vegetation under closed tree and shrub layers; low forage and wildlife values.
	32	Moderate	Moderate	Moderate	Moderate	Moderate	Fine-textured soils may be prone to erosion without vegetative cover; moderate forage and wildlife values.
	36	Moderate	Moderate	Moderate	Low	Low	Fine-textured soils may be prone to erosion without vegetative cover; low forage and wildlife values.
G	19	Low	Moderate	Low	Moderate	High	Fine-textured soils may be prone to erosion without vegetative cover; moderate forage and wildlife values.
H	44	Low	Low	High	Low	High	Logged sites, vegetative cover increasing rapidly; high forage and wildlife values.
	34	Low	Low	Moderate	Low	High	Logged sites, vegetative cover increasing rapidly; high forage and wildlife values.
I	11	High	High	High	Moderate	Moderate	High-elevation sites subject to heavy precipitation; moderate forage and wildlife values.
	12	High	Low	High	Moderate	Low	High-elevation sites subject to heavy precipitation; low forage values and moderate wildlife values.
	14	High	High	High	Low	Moderate	High-elevation sites subject to heavy precipitation; moderate forage values and low wildlife values.

[1] Vegetation types are arranged as per analysis (see Figure 3.1). The type names are presented in Table 4.1.

TABLE 4.5 (Continued)

BROAD VEG. GROUP	VEGETATION[1] TYPE	WATERSHED SIGNIFICANCE	SOIL EROSION CONTROL	REVEGETATION AFTER DISTURBANCE	CONSERVATION VALUE	FORAGE PRODUCTIVITY	INTERPRETIVE COMMENTS
I	13	High	Low	High	Low	Low	High-elevation depressions and draws subject to cold air influences; low forage and wildlife values.
J	40	Moderate	Moderate	Moderate	Moderate	Moderate	Dry steep slopes may be prone to erosion without vegetative cover; moderate forage and wildlife values.
	37	Low	Low	High	Low	Low	Sparse vegetation under closed tree and shrub layers; low forage and wildlife values.
	35	Moderate	High	Moderate	Low	Low	Dry steep slopes may be prone to erosion without vegetative cover; low forage and wildlife values.
K	41	Moderate	Moderate	Moderate	Moderate	Moderate	Fine-textured soils may be prone to erosion without vegetative cover; moderate forage and wildlife values.
	39	Moderate	High	Moderate	Moderate	Moderate	Fine-textured soils on steep slopes will erode easily without vegetative cover; moderate forage and wildlife values.
	38	Low	Moderate	High	Low	Low	Sparse vegetation under closed tree and shrub layers, dominated by regenerating western red cedar; low forage and wildlife values.
	29	Moderate	Moderate	Moderate	Low	Low	Coarse-textured soils on steep slopes may be prone to erosion without vegetative cover; regenerating western red cedar dominates the shrub layers; low forage and wildlife values.
	31	Moderate	Low	High	Low	Low	Regenerating western red cedar and western hemlock dominate the shrub layers; low forage and wildlife values.
L	1	High	Low	High	High	Low	Decadent forests of western hemlock and western red cedar; low forage and wildlife values.
	2	High	High	High	High	Low	Fine-textured soils on steep slopes will erode easily without vegetation; decadent forests of western hemlock and western red cedar; low forage values and moderate wildlife values
	3	High	Moderate	High	High	Moderate	High-elevation western hemlock and western red cedar forests significant for watershed management; moderate forage and wildlife values.

[1] Vegetation types are arranged as per analysis (see Figure 3.1). The type names are presented in Table 4.1.

TABLE 4.5 (Continued)

BROAD VEG. GROUP	VEGETATION[1] TYPE	WATERSHED SIGNIFICANCE	SOIL EROSION CONTROL	REVEGETATION AFTER DISTURBANCE	CONSERVATION VALUE	FORAGE PRODUCTIVITY	INTERPRETIVE COMMENTS
L	4	High	Moderate	High	High	High	Subsurface water flow frequent - significant for watershed management; high forage values and low wildlife values.
M	45	Low	Low	High	Low	Moderate	Logged sites, vegetative cover increasing rapidly; moderate forage values and low wildlife values.
	7	High	Low	High	High	Low	Mature alpine fir and Engelmann spruce forests significant for watershed management; low forage values and moderate wildlife values.
	9	High	Moderate	High	High	Moderate	Mature alpine fir and Engelmann spruce forests significant for watershed management; moderate forage and wildlife values
	8	High	Moderate	High	High	Moderate	Fine-textured soils may be prone to erosion without vegetative cover; mature alpine fir and Engelmann spruce forests; moderate forage values and low wildlife values.
	6	Moderate	Moderate	Moderate	High	Moderate	Cold subalpine sites will take more time to revegetate after disturbance; moderate forage and wildlife values.
N	42	High	High	Low	High	Moderate	Highly significant for watershed management (deep snow accumulations); moderate forage values and high wildlife values.
	5	Moderate	High	Low	High	High	Snow accumulations significantly lower than in type 42; high forage and wildlife values for caribou; limited distribution in study area.

[1] Vegetation types are arranged as per analysis (see Figure 3.1). The type names are presented in Table 4.1.

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appendix A

GLOSSARY OF TECHNICAL TERMS

A. GLOSSARY OF TECHNICAL TERMS

alpine tundra
Treeless area, dominated by cold-tolerant vegetation often consisting of low-matted shrubs and herbs requiring only a short period of time to complete their life cycle (Walmsley, et al ed., 1980).

biophysical classification
Differentiation of landscape units on the basis of geology, terrain, climate, soil and vegetation (Walmsley and van Barneveld, 1977).

climatic moisture deficit and surplus
The algebraic difference between May to September precipitation and seasonal potential evapotranspiration. Deficits are negative values and surpluses are positive values (R.A.B., 1978).

climax vegetation
Plant communities that have reached a stable equilibrium with their environment are referred to as climax vegetation. The climax vegetation will vary with site conditions (extremes of wet and dry) (Walmsley, et al ed., 1980).

closed forests
Coniferous, deciduous or mixed forests having a canopy cover greater than 50% (synonymous with dense forests).

floodplain
The flat or very gently sloping land bordering a stream or river, subject to periodic flooding and formed through accumulation of stream deposits.

freeze free period
The greatest number of consecutive days in a calendar year free of a temperature of 0° C or less (R.A.B., 1978).

growing degree days
The accumulated difference between the mean daily temperature and the standard base temperature of 5° C on days when the mean daily temperature is above 5° C (R.A.B., 1978).

growing season precipitation
That precipitation which falls during the growing season (R.A.B., 1978).

herb layer
The layer of vegetation containing all herbaceous plants and dwarf shrubs growing on the dominant substrate (Walmsley, et al ed., 1980).

key
A step-by-step key to vegetation types using species listings by which progressively more detailed levels of vegetation are identified. The key aids in identification of vegetation at site specific or broad levels (see Figure 3.1, page 22).

krummholz
An area of interrupted cover of subalpine tree species, which are stunted because of climatic conditions. Tree islands are often interspersed with open subalpine meadows or alpine tundra-like vegetation (Walmsley, et al ed., 1980).

mean annual precipitation
The average amount of total precipitation which falls during a year (R.A.B., 1978).

mean annual snowfall
The average amount of snow which falls during a year (R.A.B., 1978).

moss layer
The layer of vegetation containing all mosses, lichens and liverworts growing on the dominant substrate (Walmsley, et al ed., 1980).

open forests
Coniferous, deciduous or mixed forests having a canopy cover between 25 and 50%.

parkland forests
Coniferous, deciduous or mixed forests having a canopy cover of less than 25%.

Region (Forest Region)
The area over which sequences of zones extend, usually characterized by one zone, indicative of a predominant climatic system (van Barneveld, 1976).

Section (Forest Section)
A division of a Region based on different vertical sequences of zones (van Barneveld, 1976). For example, in the Salmon Arm Section the Interior western red cedar zone occurs below the Interior western hemlock - western red cedar zone, while in the Trout Lake Section only the Interior western hemlock - western red cedar zone occurs.

seral vegetation
Plant communities that are part of a successional pattern leading to a climax community are referred to as seral vegetation. Plants that are not found in the climax stage are called seral species (Walmsley, et al ed., 1980).

subzone (Forest subzone)
Subzones reflect gross differences in growth form of the dominant tree canopy or of different seral tendencies. Both factors reflect climatic conditions resulting from the topography of the landscape (van Barneveld, 1976) and the nature of the air masses to which it is exposed.

succession
The process by which vegetation colonizes and changes over a period of time. The final stage is climax vegetation.

successional pattern
The sequence of recognizable stages (including the climax community) in the succession of the vegetation of specific sites comprise a successional pattern.

shrub layer
The layer of vegetation containing shrubs (except dwarf shrubs) and tree regeneration. It is divided into low shrubs (less than 2 m) and tall shrubs (2-10 m) (Walmsley, et al ed., 1980).

tree canopy (also tree layer)
The layer of vegetation containing tree species taller than ten metres (Walmsley, et al ed., 1980).

vegetation type
A recurring or unique assemblage of plants. In analytical work it is usually represented by a statistical grouping of vegetation plots of similar species composition. It usually occurs under similar environmental conditions.

zone (Forest zone)
The area over which sites of similar soil and terrain characteristics have the same potential dominant climax. Vegetation which is a reflection of the local climate. In British Columbia the dominant climax vegetation often consists of tree species (Walmsley and van Barneveld, 1977).

appendix B

LIST OF PLANT SPECIES

B. LIST OF PLANT SPECIES

The plant species in this list were recorded in one or more plots in the study area. Other species may occur.

Plants marked with an asterisk were used in the analysis.

Trees, shrubs and herbs are named according to Taylor and MacBryde (1977). Botanical names for mosses are after Crum, Steere and Anderson (1973). Some of the common names for mosses have been standardized within the Vegetation Unit of the Terrestrial Studies Branch.

Common Name	Botanical Name
Trees	
*alpine fir	Abies lasiocarpa
black cottonwood	Populus balsamifera subsp. trichocarpa
*common paper birch	Betula papyrifera
*Englemann spruce	Picea engelmannii
*lodgepole pine	Pinus contorta
*ponderosa pine	Pinus ponderosa
*Rocky Mountain Douglas-fir	Pseudotsuga menziesii
*trembling aspen	Populus tremuloides
*western hemlock	Tsuga heterophylla
*western larch	Larix occidentalis
*western red cedar	Thuja plicata
*western white pine	Pinus monticola
white spruce	Picea glauca
Shrubs	
*alders[1]	Alnus spp.
*American red elder	Sambucus racemosa
*American red raspberry	Rubus idaeus
baldhip rose	Rosa gymnocarpa
big basin sagebrush	Artemisia tridentata subsp. tridentata
*birch-leaved spirea	Spiraea betulifolia subsp. lucida
*black blueberry	Vaccinium membranaceum
black hawthorn	Crataegus douglasii
black swamp gooseberry	Ribes lacustre
*California filbert	Corylus cornuta var. californica
*choke cherry	Prunus virginiana
*common juniper	Juniperus communis
common Labrador tea	Ledum groenlandicum
*common saskatoon	Amelanchier alnifolia
*common snowberry	Symphoricarpos albus
*currants[1]	Ribes spp.
*devil's-club	Oplopanax horridus
hardhack	Spiraea douglasii
high bush cranberry	Viburnum edule
Lewis' mock-orange	Philadelphus lewisii
mallow ninebark	Physocarpus malvaceus
northern black currant	Ribes hudsonianum
*oceanspray	Holodiscus discolor
*Oregon boxwood	Paxistima myrsinites
*oval-leaved blueberry	Vaccinium ovalifolium
prickly rose	Rosa acicularis
rabbithrush	Chrysothamnus nauseosus

[1] All species of this genus in the study area are grouped.

Shrubs (Continued)	
*red huckleberry	Vaccinium parvifolium
red-osier dogwood	Cornus sericea
redstem ceanothus	Ceanothus sanguineus
Rocky Mountain juniper	Juniperus scopulorum
*Rocky Mountain maple	Acer glabrum
*roses[1]	Rosa spp.
*rusty Pacific menziesia	Menziesii ferruginea subsp. ferruginea
Sitka mountain alder	Alnus viridis subsp. sitchensis
*Sitka mountain-ash	Sorbus sitchensis
soopolallie	Shepherdia canadensis
*tall Oregon-grape	Mahonia aquifolium
thin-leaved mountain alder	Alnus incana subsp. tenuifolia
three-tip sagebrush	Artemisia tripartita
*twinberry honeysuckle	Lonicera involucrata
*Utah honeysuckle	Lonicera utahensis
western birch	Betula occidentalis
*western thimbleberry	Rubus parviflorus
western swamp kalmia	Kalmia microphylla
*western yew	Taxus brevifolia
*white-flowered rhododendron	Rhododendron albiflorum
*willows[1]	Salix spp.
Herbs	
Alaska onion grass	Melica subulata
*Alaska rein-orchid	Platanthera unalascensis
Alaska saxifrage	Saxifraga ferruginea
Alberta penstemon	Penstemon albertinus
alpine club-moss	Lycopodium alpinum
*alpine pussytoes	Antennaria alpina
alpine sandwort	Minuartia obtusiloba
alpine speedwell	Veronica wormskjoldii
alpine timothy	Phleum alpinum
American skunk cabbage	Lysichiton americanum
American stinging nettle	Urtica dioica subsp. gracilis
*American vetch	Vicia americana
angelicas	Angelica spp.
Arctic colt's-foot	Petasites frigidus
Arctic lupine	Lupinus arcticus
*arrow-leaved balsamroot	Balsamorhiza sagittata
*arrow-leaved ragwort	Senecio triangularis
*asters[2]	Aster spp.
beaked sedge	Carex rostrata
*beardless bluebunch wheat grass	Agropyron spicatum subsp. inerme
bent grasses	Agrostis spp.
big-leaved lupine	Lupinus polyphyllus
bitterroot lewisia	Lewisia rediviva
black crowberry	Empetrum nigrum
*blue grasses[3]	Poa spp.
*blue-bead clintonia	Clintonia uniflora
blue-eyed grasses	Sisyrinchium spp.
*blue-leaved wild strawberry	Fragaria virginiana subsp. glauca
*blue wild rye grass	Elymus glauca
bog cranberry	Vaccinium oxycoccus
*bracted lousewort	Pedicularis bracteosa
brittle prickly-pear cactus	Opuntia fragilis
*broad-leaved arnica	Arnica latifolia
*broad-leaved twayblade	Listera convallarioides

[1] All species of this genus in the study area are grouped.

[2] All aster species within the study area, other than showy aster, have been grouped together.

[3] All blue grass species within the study area, other than Sandberg's blue grass, have been grouped together. Most frequently occurring are Kentucky blue grass, inland blue grass and high-elevation blue grasses.

Herbs (Continued)

*brome grasses[1]	Bromus spp.
brown-eyed Susan	Gaillardia aristata
buckbean	Menyanthes trifoliata
buttercups	Ranunculus spp.
California oat grass	Danthonia californica
Canada milk-vetch	Astragulus canadensis
Canada violet	Viola canadensis
*Canadian bunchberry	Cornus canadensis
Canadian goldenrod	Solidago canadensis
chickweeds	Cerastium spp.
chocolate lily	Fritillaria lanceolata
clasping arnica	Arnica amplexicaulis
*clovers[2]	Trifolium spp.
cockleburs	Xanthium spp.
*Columbia brome grass	Bromus vulgaris
*Columbia gromwell	Lithospermum ruderale
*Columbia lily	Lilium columbianum
Columbia mugwort	Artemisia lindleyana
Columbian monkshood	Aconitum columbianum
columbines	Aquilegia spp.
common butterwort	Pinguicula vulgaris
*common dandelion	Taraxacum officinale
common harebell	Campanula rotundifolia
*common lady fern	Athyrium filix-femina
*common pink pyrola	Pyrola asarifolia
common red Indian paintbrush	Castilleja miniata
common selaginella	Selaginella densa
common self-heal	Prunella vulgaris
*common western pipsissewa	Chimaphila umbellata subsp. occidentalis
*common yarrow	Achillea millefolium
cotton-grasses	Eriophorum spp.
*cow-parsnip	Heracleum sphondylium
*cream-coloured peavine	Lathyrus ochroleucus
creeping snowberry	Gaultheria hispidula
crested shield fern	Dryopteris cristata
cucumberroot twistedstalk	Streptopus amplexifolius
Cusick's blue grass	Poa cusickii
diffuse knapweed	Centaurea diffusa
docks	Rumex spp.
Douglas' aster	Aster subspicatus
Douglas' water-hemlock	Cicuta douglasii
*drooping brome grass	Bromus tectorum
dropseeds	Sporobulus spp.
dwarf blueberry	Vaccinium caespitosum
dwarf red blackberry	Rubus pubescens
early blue violet	Viola adunca
enchanter's nightshade	Circaea alpina
elephant's-head lousewort	Pedicularis groenlandica
fairyslipper	Calypso bulbosa
false dandelions	Agoseris spp.
*false Solomon's-seal	Smilacina racemosa
fern-leaved lomatium	Lomatium dissectum
field mint	Mentha arvensis
*field pussytoes	Antennaria neglecta
fine-leaved fleabane	Erigeron linearis
*fireweed	Epilobium angustifolium
*five-leaved creeping raspberry	Rubus pedatus
*five-stamened mitrewort	Mitella pentendra

[1] All brome grasses within the study area, other than drooping brome grass and Columbia brome grass, have been grouped together.

[2] All species of this genus in the study area are grouped.

Herbs (Continued)

*fleabanes[1]	Erigeron spp.
fringed grass-of-parnassus	Parnassia fimbriata
garden asparagus	Asparagus officinalis
graceful cinquefoil	Potentilla gracilis
*grass-leaved death-camas	Zigadenus venenosus
*great mullein	Verbascum thapsus
*green false hellebore	Veratrum viride
*green pyrola	Pyrola chlorantha
green-flowered alumroot	Heuchera chlorantha
green-flowered rein-orchid	Platanthera hyperborea
*grouseberry	Vaccinium scoparium
hairy golden-aster	Heterotheca villosa
*heart-leaved arnica	Arnica cordifolia
*heart-leaved twayblade	Listera cordata
hemlock water-parsnip	Sium suave
*Holboell's rock-cress	Arabis holboellii
*hound's-tongue hawkweed	Hieracium cynoglossoides
Idaho bent grass	Agrostis idahoensis
*Idaho fescue	Festuca idahoensis
*Indian paintbrushes[2]	Castilleja spp.
inland blue grass	Poa interior
interior small bedstraw	Galium trifidum
Kentucky blue grass	Poa pratensis
*kinnikinnick	Arctostaphylos uva-ursi
knapweeds	Centaurea spp.
knotweeds	Polygonum spp.
large-fruited lomatium	Lomatium macrocarpum
large-leaved avens	Geum macrophyllum
*large-leaved rattlesnake orchid	Goodyera oblongifolia
leafy-bracted aster	Aster foliaceus
leatherleaf saxifrage	Leptarrhena pyrolifolia
lesser burdock	Arctium minus
Lewis' monkeyflower	Mimulus lewisii
long beech fern	Thelypteris phegopteris
low pussytoes	Antennaria dimorpha
*luetkea	Luetkea pectinata
*lupines[2]	Lupinus spp.
manna grasses	Glyceria spp.
marsh skullcap	Scutellaria galericulata
meadow horsetail	Equisetum pratense
medics	Medicago spp.
melic grasses	Melica spp.
*Merten's cassiope	Cassiope mertensiana
microseris'	Microseris spp.
mountain forget-me-not	Myosotis asiatica
mountain lady's-slipper	Cypripedium montanum
*mountain sweetcicely	Osmorhiza chilensis
Montana delphinium	Delphinium bicolor
narrow-leaved cow-wheat	Melampyrum lineare
narrow-leaved stephanomeria	Stephanomeria tenuifolia
narrow-petaled stonecrop	Sedum stenopetalum
*needle-and-thread grass	Stipa comata
northern bedstraw	Galium boreale
northern gentian	Gentianella amarella
northern maidenhair fern	Adiantum pedatum
northern red-fruited comandra	Geocaulon lividum
*northern twinflower	Linnaea borealis
northwestern sedge	Carex concinnoides
*Nuttall's pussytoes	Antennaria parviflora
*oak fern	Gymnocarpium dryopteris
old-man's whiskers	Geum triflorum
one-flowered wintergreen	Moneses uniflora

[1] All fleabane species within the study area, other than subalpine fleabane, have been grouped together.

[2] All species of this genus in the study area are grouped.

Herbs (Continued)

*one-leaved rein orchid	Platanthera obtusata
one-sided wintergreen	Orthilia secunda
orchard grass	Dactylus glomerata
*Oregon wintergreen	Gaultheria ovatifolia
pale comandra	Comandra umbellata subsp. pallida
*pearly everlasting	Anaphalis margaritacea
penny cresses	Thlaspi spp.
*pine grass[1]	Calamagrostis spp.
poison-ivy	Toxicodendron rydbergii
*poverty oat grass	Danthonia spicata
*prairie koeleria	Koeleria macrantha
prairie sagebrush	Artemisia frigida
purple-leaved willowherb	Epilobium ciliatum
*racemose pussytoes	Antennaria racemosa
*red baneberry	Actaea arguta
*red mountain-heather	Phyllodoce empetriformis
reed canary grass	Phalaris arundinacea
rice grasses	Oryzopsis spp.
Richardson's sedge	Carex richardsonii
Ross' sedge	Carex rossii
rough fescue	Festuca scabrella
*rough-fruited fairybells	Disporum trachycarpum
*rough-leaved rice grass	Oryzopsis asperifolia
round-leaved sundew	Drosera rotundifolia
*rushes	Juncus spp.
*sagebrush mariposa lily	Calochortus macrocarpum
*Sandberg's blue grass	Poa sandbergii
sandworts	Arenaria spp.
*sedges	Carex spp.
shaggy fleabane	Erigeron pumilus
*showy aster	Aster conspicuus
showy Jacob's-ladder	Polemonium pulcherrimum
showy milkweed	Asclepias speciosa
*sickle-top lousewort	Pedicularis racemosa
silky lupine	Lupinus sericeus
silverleaf phacelia	Phacelia hastata subsp. hastata
*simple-stemmed twistedstalk	Streptopus roseus
*Sitka valerian	Valeriana sitchensis
slender blue penstemon	Penstemon procerus
slender hair grass	Deschampsia elongata
slender hawk's-beard	Crepis atrabarba
slender hawkweed	Hieracium gracile
slough sedge	Carex obnupta
*small western needle grass	Stipa occidentalis var. minor
small white violet	Viola macloskeyi
small-flowered blue-eyed Mary	Collinsia parviflora
small-flowered woodlandstar	Lithophragma parviflorum
small-flowered wood-rush	Luzula parviflora
*smooth wood-rush	Luzula hitchcockii
soft-leaved sedge	Carex disperma
spike trisetum	Trisetum spicatum
*spiny shield fern	Dryopteris assimilis
spotted coralroot	Corallorhiza maculata
spotted knapweed	Centaurea maculosa
*spreading dogbane	Apocynum androsaemifolium
*star-flowered false Solomon's-seal	Smilacina stellata
*stiff club-moss	Lycopodium annotinum
striped coralroot	Corallorhiza striata
*subalpine buttercup	Ranunculus escholtzii
*subalpine fleabane	Erigeron peregrinus
sulphur-flowered umbrellaplant	Eriogonum umbellatum

[1] Most commonly occurring is Calamagrostis rubescens.

Herbs (Continued)

*sweet-scented bedstraw	Galium triflorum
sylvan goat's-beard	Aruncus dioicus
tall fringecup	Tellima grandiflora
thistles	Cirsium spp.
thread-leaved phacelia	Phacelia linearis
*timber milk-vetch	Astragalus miser
timothy	Phleum pratense
*trailflower	Adenocaulon bicolor
trifoliate-leaved foamflower	Tiarella trifoliata
upland delphinium	Delphinium nuttallianum
*violets[1]	Viola spp.
weak false manna	Torreyochloa pauciflora
*western blue clematis	Clematis occidentalis subsp. grosseserrata
*western bracken	Pteridium aquilinum
*western fescue	Festuca occidentalis
western golden ragwort	Senecio pseudaureus
*western meadow-rue	Thalictrum occidentale
*western pasqueflower	Pulsatilla occidentalis
*western spring beauty	Claytonia lanceolata
western white trillium	Trillium ovatum
*western wild ginger	Asarum caudatum
white cinquefoil	Potentilla arguta
*white globeflower	Trollius laxus
*white-flowered hawkweed	Hieracium albiflorum
*white-veined pyrola	Pyrola picta
whitlow grasses	Draba spp.
wild bergamot	Monarda fistulosa
*wild sarsaparilla	Aralia nudicaulis
witch grass	Panicum capillare
wood horsetail	Equisetum sylvaticum
wood reed grass	Cinna latifolia
*wood strawberry	Fragaria vesca
*yellow glacier lily	Erythronium grandiflorum
yellow willowherb	Epilobium luteum
yellow wood violet	Viola glabella
yellowbell fritillary	Fritillaria pudica
yerba buena	Satureja douglasii

Mosses and Lichens

brachytheciums	Brachythecium spp.
cladonias	Cladonia spp.
*common moss	Pleurozium schreberi
*green-stemmed pipecleaner	Rhytidiopsis robusta
grimmias	Grimmia spp.
*hairy-cap mosses[1]	Polytrichum spp.
hypnums	Hypnum spp.
*large cushion moss	Dicranum scoparium
*mniums[1]	Mnium spp.
*red-stemmed pipecleaner	Rhytidiadelphus triquetrus
*small cushion moss	Dicranum fuscescens
sphagnums	Sphagnum spp.
*step moss	Hylocomium splendens
*thin cushion moss	Dicranum strictum

[1] All species of this genus in the study area are grouped.

appendix C

LIST OF ANIMAL SPECIES

C. LIST OF ANIMAL SPECIES[1]

Common Name	Scientific Name
black bear	Ursus americanus
caribou	Rangifer tarandus
grizzly bear	Ursus arctos horribilis
moose	Alces alces
mountain goat	Oreamos americanus
mule deer	Odocoilus hemionus columbianus
pileated woodpecker	Dryocopus pileatus
sapsuckers	Sphyrapicus spp.
sheep	Ovis canadensis californiana

[1] Animal species names were provided by D. Low (pers. comm.).

appendix D

SUCCESSIONAL PATTERNS AND WILDLIFE USE

D. SUCCESSIONAL PATTERNS AND WILDLIFE USE

Table D.1 (Thomas, 1980) is presented to illustrate how vegetation information, in the form of successional patterns, can be related to relative animal abundance and wildlife values, for any species.

The successional pattern is subdivided into relevant age classes, which are described in terms of habitat composition and related to vegetation types and broad vegetation groups. Wildlife value ratings are given for mule deer, caribou and pileated woodpecker and relative animal abundance for these three species is graphically illustrated for the entire successional pattern.

Table D.1, by no means inclusive, embodies the philosophy of managing all habitats for all wildlife species.

TABLE D.1 SUCCESSIONAL PATTERNS AND WILDLIFE USE

Rocky Mountain Douglas-fir - western hemlock Successional Pattern

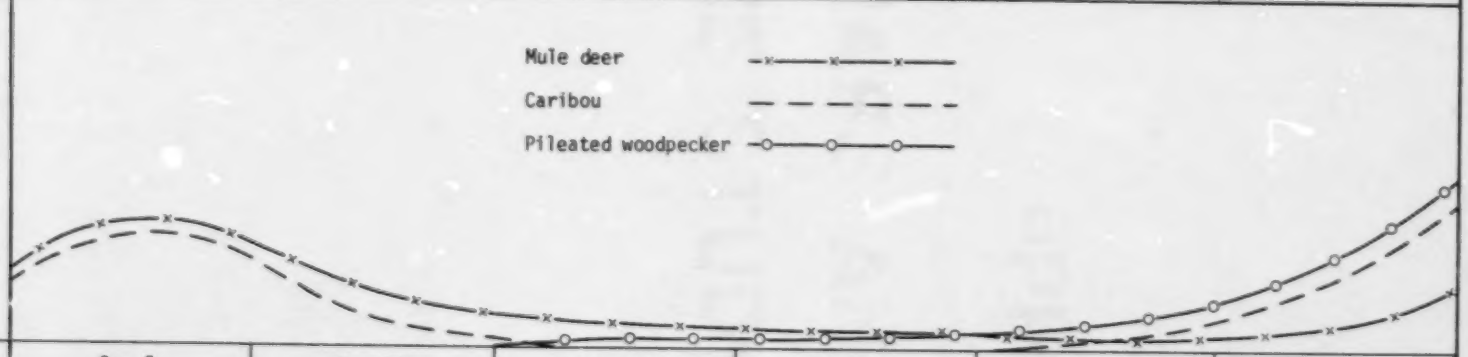
ENVIRONMENTAL FEATURES[1]	Mean annual precipitation: 480 to 1100 mm Mean growing season precipitation: 250 to 350 mm Mean annual snowfall: 130 to 420 cm	Growing degree days: 900 to 1700 Freeze free period: 80 to 120 days Climatic moisture deficit/surplus: -100 to +100 mm	Elevation: 570 to 1200 m Slope: 0 to 31% Aspect: 90 to 315°			
STAND AGE (years)	0 - 5	5 - 20	20 - 50	50 - 100	100 - 150	150 - 250
VEGETATION TYPES AND BROAD GROUPS	34 H	37 J	37 J	29,31,38 K	29,31 K	1 I
HABITAT DESCRIPTION	Trees absent, regenerating Rocky Mountain Douglas-fir. Trembling aspen may grow in patches as a shrub. Western thimbleberry and Oregon boxwood are other characteristic shrubs. The herb layer is dominated by fireweed.	Variable tree cover (<40%) composed of Rocky Mountain Douglas-fir, western larch, western red cedar and western white pine. Shrub cover may be thick composed of conifer trees, Oregon boxwood, western thimbleberry, tall Oregon-grape and birch-leaved spirea. Herbs are sparse.	Closed tree canopy (>50%) of Rocky Mountain Douglas-fir, western larch, western red cedar and western white pine. Western hemlock is regenerating, shrub and herb layers are unchanged.	Closed tree canopy (60-70%) with the same species as in previous stage including western hemlock. Shrub layers are primarily regenerating western red cedar and western hemlock, also black blueberry and Oregon boxwood. Herbs are sparse.	Tree canopy may become more closed (>70%), western hemlock and western red cedar become dominant. Shrub layers still regenerating western hemlock and western red cedar but more open, with black blueberry and Oregon boxwood. Herbs are sparse.	Tree canopy closed (>75%), western hemlock and western red cedar are dominant. Shrub layers of regenerating conifers, Oregon boxwood, black blueberry and western yew are open. Herb layer is sparse; typical plants are Canadian bunchberry and blue-bead clintonia.
WILDLIFE VALUES[2]						
Mule deer values	Summer and fall use	Summer and fall use	Summer and fall use	Later summer and fall use	Shelter use	Shelter use
Food	Forage values high through summer and fall	Moderate forage values through summer and fall	Low to moderate forage values through summer and fall	Low forage vlaues	Low forage values	Low forage values
Shelter	Low shelter value	Low shelter value	Low shelter value	Low to moderate shelter values	Moderate to high shelter values	High shelter values
Reproduction	Often fawning sites	Some fawning	Nil	Nil	Nil	Nil
Caribou values	Key spring range also used in fall before snow accumulation	Spring use and in fall before snow accumulation	Very little use	Very little use	Late fall and early winter use	Late fall and early winter use
Food	Forage values high on new growth	Forage values moderate on young growth	Forage values low	Forage values very low	Forage values low	Forage values moderate to high
Shelter	Nil	Very low shelter value	Very low shelter value	Low to moderate shelter value	Moderate shelter value	High shelter value - especially in years of deep snow
Reproduction	Nil	Nil	Nil	Nil	Nil	Nil

[1] Climate data are from Canadian Normals for Precipitation, 1941-1970, Environment Canada and R.A.B. climate network information.

[2] All wildlife information is from D. Low (pers. comm.).

TABLE D.1 (Continued)

WILDLIFE VALUES[1]	Pileated woodpecker values	Virtually no use	Virtually no use	Very low use	Very low use	Low use	Some use related to density of snags, 100% of population - one 51 cm snag every 3 hectares, 50% of population - one 51 cm snag every 6 hectares.
	Food	Nil	Nil	Very low	Very low, wood borers	Very low to low, wood borers	Low to high for food and nesting, snags with heart rot >56 cm
	Shelter	Nil	Nil	Nil	Nil	Very low	
	Reproduction	Nil	Nil	Nil	Nil	Very low nesting, snags with heart rot >56 cm	
RELATIVE ANIMAL ABUNDANCE							
STAND AGE (years)		0 - 5	5 - 20	20 - 50	50 - 100	• 100 - 150	150 - 250



[1] All wildlife information is from D. Low (pers. comm.).

appendix E

MAPS AND DATA IN THE STUDY AREA

E. MAPS AND DATA IN THE STUDY AREA

E.1 AVAILABLE MAPS

a. Vegetation Types of the Adams River Drainage

Map of vegetation types produced for a resource analysis study of the Adams River, on a 1:20 000 scale.

b. Present Vegetation of the Adams River Drainage

Map of present ecological condition (now landscape units) produced in a resource analysis study of the Adams River, on a 1:20 000 scale (Appendix IV-3-1 of Adams River - A Resource Analysis).

c. Vegetation Types of the East Canoe Drainage

Map of vegetation types produced in a multi-discipline study of the East Canoe drainage, at a 1:50 000 scale.

d. Forest Zonation/Present Ecological Condition Maps

These maps at 1:50 000 are available for all of 82L. Zones and subzones are depicted as well as present ecological condition units (now called vegetation landscapes).

E.2 AVAILABLE DATA

a. Adams River - A Resource Analysis. 1977. Analysis/Interpretation Division, Resource Analysis Branch, Victoria.

This report is a resource analysis study of the Adams River drainage. Included are vegetation type descriptions, interpretation of vegetation types for sensitivity and visual attributes and a species list.

b. Visual Analysis of Common Plants in the Spallumcheen Municipality, 1975. Vegetation Section, Resource Analysis Branch, Ministry of Environment, Kelowna, B.C.

Requests for Forest Zonation/Present Ecological Condition maps should be addressed to:

Map Library
Assessment and Planning Division
Ministry of Environment
Parliament Buildings
Victoria, B.C.
V8V 1X4

All other requests should be addressed to:

Manager

Ministry of Environment

Terrestrial Studies Branch

Parliament Buildings

Victoria, B.C.

V8V 1X4

LIST OF APD BULLETINS

A BULLETIN is one of four Regular Publication series produced by the Division. (This series replaces the former Resource Analysis Branch series). Bulletins present the results of technical or scientific studies including the interpretation or application of resource data.

APD BULLETIN 1 - Saanich Peninsula Spring-Time Freeze Risk. R.R.H. Chilton.

APD BULLETIN 2 - Soil and Vegetation Resources of the Pend-d'Oreille Valley, B.C. T. Vold, R.F. Ferster, T.K. Ovanin, R.D. Marsh, G.P. Woods.

APD BULLETIN 3 - Regional Hydrology of the Northeast Coal Study Area. Michael J. Miles.

APD BULLETIN 4 - Studies on Aquatic Macrophytes Part XXXI. J.R. Rudolph, C.E.W. Dyer.

APD BULLETIN 5 - Terrain Inventory and Geological Hazards: Northern Vancouver Island. D.E. Howes.

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APD BULLETIN 7 - Biophysical Resources of the East Kootenay Area: Terrain. J.M. Ryder.

APD BULLETIN 8 - Biophysical Resources of the East Kootenay Area: Outdoor Recreation. L.E. (Beth) Collins.

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APD BULLETIN 10 - Resources of the Graystokes - Report to Task Group. Technical Subcommittee.

APD BULLETIN 11 - Fraser River Estuary Study, Water Quality, Dry Weather Storm Sewer Discharges. M. Clark, P. Krahn, J. Walker.

APD BULLETIN 12 - Phosphorus Retention of Shawnigan Lake Watershed Soils: Management Implications for Subsurface Disposal Systems. N.K. Nagpal.

APD BULLETIN 13 - Shawnigan Lake Watershed Study: Background Report 1. Use of Percolation and Hydraulic Conductivity Measurements in Design and Management of Soil Waste Disposal Systems. N.K. Nagpal.

APD BULLETIN 14 - Shawnigan Lake Watershed Study: Background Report 2. An Evaluation of Use of Ceramic Cup Soil Water Samplers in Nutrient Transport Studies. N.K. Nagpal.

APD BULLETIN 15 - Eurasian Water Milfoil Studies Volume 1: The Effect of Eurasian Water Milfoil (MYRIOPHYLLUM SPICATUM L.) on Fish and Waterfowl in the Okanagan Valley, 1977. M.C. Robinson.

APD BULLETIN 16 - Kootenay Air and Water Quality Study, Phase II: Water Quality in the Upper Columbia River Basin.

APD BULLETIN 17 - Studies on Aquatic Macrophytes Part XXXIV - The 1980 Aquatic Plant Quarantine Project. R. Dove and M. Wallis

APD BULLETIN 18 - Fraser River Estuary Study, Water Quality, Survey of Dissolved Oxygen in 1978. W. A. Bergerud, L. J. Alexander.

APD BULLETIN 19 - Vegetation Resources of the Vernon Map Sheet Area. Volumes 1 and 2. C. J. Clement.